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# Plan Addendum

## Phase 3 Additional Sampling Plan: Revision 3

for the  
Remedial Investigation/Feasibility Study  
for Brown's Dump Site



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July 2005

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June 27, 2005

Mr. Wesley S. Hardegree  
Waste Management Division  
Atlanta Federal Center  
61 Forsyth St. SW  
Atlanta, GA 30303-8960

Subject: Response to Draft Comments on Additional (Phase 3) RI/FS Work Plan  
(Revision 3) Dated May 12, 2005  
Brown's Dump - Jacksonville, Florida  
EPA I.D. Number: FLD 980 847 016

Dear Mr. Hardegree:

On behalf of the City of Jacksonville, CH2M HILL is submitting one copy of the Response to Environmental Protection Agency (EPA) Comments on the Work Plan for Remedial Investigation/Feasibility Study (RI/FS) Addendum for review and approval. The comments were received, via e-mail, on May 12, 2005. Upon approval of the document, the Brown's Dump Work Plan Addendum, Revision No. 3 will be revised and finalized.

Questions or comments you may have concerning the Response to EPA Comments on the Work Plan for RI/FS Addendum Revision 2 should be directed to the undersigned at 904.733.9119, or to Chris Pearson at 904.630.4593.

Sincerely,

CH2M HILL, Inc.

Anthony R. Wagner, P.G.  
Project Manager

A. Tracy Langille, P.G.  
Project Hydrologist

Enclosures: Response to EPA Comments

Cc: Chris Pearson, City of Jacksonville - Solid Waste Division  
Mike Fitzsimmons, FDEP - Northeast District  
CH2M HILL, Inc. - Project File  
Aaron Hilliard, Duval County Health Department

**RESPONSE TO EPA COMMENTS ON THE WORK PLAN ADDENDUM: PHASE 3  
ADDITIONAL SAMPLING PLAN: REVISION 2  
BROWN'S DUMP SITE  
EPA I.D. NUMBER: FLD 980 847 016  
June 2005**

**Comment 1 - Response to Comment 4:**

- Why were only comparisons to arsenic provided for in Appendix H? To provide the basis for saying cleanup to human health will also mostly satisfy ecological concerns, there must be a demonstration that the human health remediation drivers also account for the constituents of potential ecological concern (COPEC). Please provide similar graphic comparisons of COPECs to lead (and maybe ash if the correlations hold), the other main remediation driver(s).
- In Comment 4, EPA stated its observation that more than 35 parcels should have been identified as exceeding the ecological preliminary Remedial Goal Options (RGOs). As explained in Response to Comment 4h (second paragraph), the parcels identified in Table 10-1 of the work plan as needing action for ecological receptor protection are those identified in the 2002 Ecological Risk Assessment. EPA notes that the ERA screened surface soil in relation to RI Phase I data (i.e., 1999 - 2000). Data collected from RI Phase II (i.e., 2001 - 2002) was not included in the ERA. The response concludes that "...a change to the Table 10-1 is not proposed at this time, as these additional sample locations were not identified by the ecological risk assessment as areas of interest for ecological protection."

The ERA is not a shield to further data comparisons. If the RI Phase II data were screened against the ecological preliminary Remedial Goal Options (RGOs), then the number of parcels would increase. Please perform this screening of the Phase II data (as was done in the text for Phase I data) and include the results in the work plan (or accompanying appendix).

- In the Response to Comment 4h (second paragraph), it is stated that "...aluminum and iron in the comment are all being remediated..." This is not correct. All of the aluminum is being remediated, but not all of the iron (e.g., BDSB186). Please review and revise accordingly.
- In the Response to Comment 4h, there seems to be some transitional text missing in the transition from page 3 to page 4 of the Response to Comments. Please review and revise accordingly.
- Response to Comment 4i. In this response, it is mentioned that Parcels 016 and 022 are "...on the opposite banks of Moncrief Creek...." These parcels are actually on the opposite side of Moncrief Road. Please review and revise accordingly.

**Response:**

**First Bullet:** Arsenic was the only contaminant of concern (COC) that was compared against the COPECs since arsenic has been shown to provide the best correlation with dioxins, thus far. To supplement the demonstration that the human health

remediation drivers also account for the COPEC similar graphic comparisons of COPECs to lead and ash have been completed. These graphs are provided in Appendix H.

**Second Bullet:** Agree to first paragraph. No text changes are required. The Phase 2 data has been included in Table 10-1. Additionally, the text of Section 10.1.1, Soil and Ash Sampling Strategy, has been revised to read "As can be noted in **Table 10-1**, a total of 228 parcels have been originally identified to have preliminary ecological COPECs using the Phase 1 and Phase 2 data. Of these, 162 parcels are slated for remediation and 33 parcels are proposed for sampling."

**Third Bullet:** The following was the response to previous Comment 4h. "...The COPECs identified at the end of ecological risk assessment were aluminum, antimony, copper, iron, lead, zinc, mercury, and dichlorodiphenyltrichloroethane (DDT). Currently planned actions already address parcels identified to have samples with exceedences for aluminum, antimony, and copper. Whereas, iron, mercury, and zinc were detected in some samples that are located in parcels that were not listed by the ecological risk assessment as a location of ecological concern, therefore was not included in Table 10-1. The background concentrations for most of these inorganic chemicals have a range of concentrations where maximum detected value in the background is higher than background screening value used, indicating some of the exceedences of the background could still be representative of background levels.

Upon further review of the listed exceedences identified in Attachment 2 of the Environmental Protection Agency (EPA) comments, it is noted that the samples identified for **aluminum and iron in the comment are all being remediated**, though not identified in Table 10-1. These are BDSB178 representing Parcel 217, which is being remediated...." The referenced text addresses the listed samples in the EPA comment. The response stays valid as stated, and it was not included in the text.

**Fourth Bullet:** Duly noted. The sentence at the beginning of Page 4 has been revised to read "...BDSB178 located in Parcel 217,....".

**Fifth Bullet:** The reference to "Moncrief Creek" has been revised to read "Moncrief Road."

**Comment 2 - Response to Comment 6:** A response to the comment contained in the second paragraph of Comment 6 was not included. However, the work plan seems to have been modified to address the comment.

**Response:**

Agree. No text changes are required.

**Comment 3 - Response to Comment 7:** The comment questions the units for TEQ in the table on page 10-4. The response states that the units are micrograms per kilogram (ug/kg), and "...the table has been revised to show TEQ>1 ug/kg." The table does not show "TEQ>1 ug/kg." In addition, EPA believes the units are ng/kg. Please review.

**Response:**

The concentration and units were inadvertently left off the table. The second column in the table has been revised to reflect toxicity equivalency quotient (TEQ)>1 ug/kg, which is the EPA Screening Level. The units are not ng/kg. Also, this table has been moved to Page 10-1 in the second paragraph of Section 10.1.1.

**Comment 4 - Section 10.1.1, page 10-1, 2<sup>nd</sup> paragraph:** In the last sentence of this paragraph, it is stated that a "separate analysis is being conducted for the protection of ecological receptors..." What is this separate analysis?

**Response:**

The statement was meant to imply that, based on the justification provided, a separate analysis for protection of ecological receptors is not needed. The text has been revised to reflect this clarification.

**Comment 5 - Section 10.1.1.3.1, page 10-3, middle paragraph on page:** The sentence beginning "[a]dditionally, PAHs are occurring in, the samples..." is not a sentence. Please review and revise accordingly.

**Response:**

The sentence has been revised to read "Additionally, PAHs are occurring in samples that also exceeded the criteria for one or more other parameters (i.e., arsenic, ash, or lead)."

**Comment 6 - Figure 10-1:** A box in this flow chart is in need of revising for clarity and coordination with the sampling procedure discussed on page 10-2. Specifically, see the box which starts with the following wording: "[c]omposite samples across depth intervals..." Should this be "[c]omposite samples within depth intervals..." to clarify that the compositing will occur within the depth interval (e.g., 0-6") and not across depth intervals (i.e., 0-6" and 6"-12", etc.)?

**Response:**

The wording has been revised to read "clarify that the sample compositing will occur within a depth interval, not across depth intervals."

**Comment 7 - Figure 10-1 and Section 10.1.1.3.1:** As currently designed, the plan utilizes much of the dioxin sampling to complete depth interval characterization on a parcel which has already been found to be contaminated and already in need of remediation for lead or arsenic. After further thought on utilization of resources to be applied toward dioxin analysis, EPA has determined that it is more interested in utilizing a portion of the planned dioxin sampling for confirmation that parcels shown to be clean for non-dioxin constituents are not in need of remediation to address dioxin. To accomplish this objective, EPA is re-deploying the planned dioxin samples in a slightly different way. Specifically, the plan should be revised to distribute the 100 dioxin samples as follows:

- Twenty-five samples will be analyzed for dioxin. The location of these 25 dioxin samples will be from samples with lead > 400 ppm and arsenic > 2.1 ppm. Once

analytical results are received and correlations completed, a meeting with EPA will be held to discuss the results and next steps.

- Barring a change in approach based on the correlation results, the sampling approach for the remaining 75 dioxin analyses is to analyze dioxin at parcels where all of the composited samples have visual ash <25%, XRF Pb <400 ppm, lab Pb <400 and arsenic < 2.1 ppm. Only one dioxin sample should be collected from a specific parcel, and this sole sample should be a composite from the 0-6 inch interval. NOTE: If there are not 75 parcels meeting the criteria of visual ash <25%, XRF Pb <400 ppm, lab Pb <400 and arsenic < 2.1 ppm, then the remainder can be used to complete depth interval characterization.

With this approach, the 75 dioxin samples (along with other field and laboratory measurements) will place EPA in a better position to define parcels not in need of remediation and to define the edge of the site. In addition, this approach will hopefully lesson the need for or scope of further sampling.

Attached are hand written edits to the work plan which begin to make the change in distribution of dioxin samples to meet the above re-deployment of dioxin analyses/samples. Please use these hand edits and the above comment to revise the plan. Note that the attached edits did not make any changes to Appendix D. Appendix D will have to be revised to correlate with the plan's text.

If needed, the depth interval characterization on a parcel in need of remediation could be determined during a confirmatory sampling program during Remedial Design/Remedial Action.

#### Response:

To appropriately address the proposed dioxin analytical strategy, a meeting was held in the Jacksonville, Florida, office of CH2M HILL on May 25, 2005. The purpose of the meeting was to develop a plan for future sampling and analyses conducted at the Brown's Dump Site and Jacksonville Ash Site, which will minimize dioxin sampling while meeting the needs of the City of Jacksonville (City, EPA, and Florida Department of Environmental Protection (FDEP)).

A discussion regarding the correlations and Phase 3 sampling approach led to the verbal agreement with EPA and tentative FDEP approval that for non-airborne ash deposition zones, dioxin analyses would not be required if ash was not detected *and* arsenic and lead sampling had been performed and neither exceeded the cleanup levels. This new approach was based on how FDEP is currently considering other ash sites in the Jacksonville area. This concept was more precisely worded as follows:

- For parcels within the non-airborne ash deposition zone, not otherwise requiring remediation based on arsenic > 2.1 mg/kg, lead > 400 mg/kg, or ash > 25%, **dioxin analysis would be performed** if any individual soil sample from the four depth intervals from 0 to 24 inches (i.e., the 20 individual parcel samples) had ash present (i.e., ash > 0%) or lead XRF > 400 mg/kg *or* any composite soil

sample from the four depth interval (i.e., the four composite samples) had ash present between 0 and 25%.

- For parcels requiring dioxin analysis, two composite depth interval soil samples would be analyzed: the 0- to 6-inch interval and a composite of the 6- to 24-inch interval.

As a result, the work plan has been revised to reflect the above strategy for dioxin analysis and the use of 100 dioxin analyses to further the possible correlation of dioxin results to ash, lead, or arsenic has been eliminated from the sampling strategy.

**RESPONSE TO EPA COMMENTS ON THE WORK PLAN FOR  
RI/FS ADDENDUM  
DATED MARCH 2005  
BROWN'S DUMP SITE - JACKSONVILLE, FLORIDA  
EPA I.D. NUMBER: FLD 980 847 016  
Dated March 10, 2005**

**Comment:**

1. **Section 10.1.1, page 10-1:** This section uses the phrase "ecological Remedial Goal Options (RGOs)." Since the Ecological Risk Assessment stopped at Step 3a and did not go on to complete Steps 4 through 8, technically, the phrase used at this point in the RI/FS process to describe the RGOs for ecological protection should be "preliminary Remedial Goal Options (RGOs)" or "preliminary remedial goals (PRG)."

**Response:**

Agree. The phrase "ecological Remedial Goal Options (RGOs)" has been revised to read "ecological preliminary Remedial Goal Options (RGOs)."

**Comment:**

2. **Section 10.1.1, page 10-1:** The first sentence of the second paragraph mentions Attachment A. There is no Attachment A. Do you mean Appendix G? Regarding Appendix G, please provide the R<sup>2</sup> and regression equation on each graph. Also, please identify the mean, 95% confidence limit, 95% prediction limit in a key at the beginning of Appendix G.

**Response:**

The referenced attachment should have been Appendix H, not Attachment A. This follows the original Table of Contents. Each graph in Appendix H has been revised to provide the regression equation, regression coefficient, intercept, and R<sup>2</sup>. Additionally, the mean, 95-percent confidence limit, and 95-percent prediction limit have been placed on each graph.

**Comment:**

3. **Section 10.1.1, page 10-1:** The word "sued" in the last sentence of the second paragraph in this section should be changed to "used."

**Response:**

Agree. This typographical error has been corrected.

**Comment:**

4. **Table 10-1:**
  - e. On Table 10-1, the third column refers to "Section 4.0 Figures." In what document is Section 4.0 to be found? The only figures EPA knows of with a brown, pink, green, and white color coding are figures in Section 4.0 of the FS. Please identify the specific figure and document referred to in column three.



- f. Within Table 10-1, there are 9 parcels whose status is listed as "Additional Sampling for COCs." Two of these parcels identified for additional sampling, Parcels 016 (i.e., BDSB042) and 022 (i.e., BDSB043), are actually not identified on Figure 12-3 of the work plan for additional sampling. In addition, neither are these parcels identified for covering or excavation in Section 4.0 of the FS. Please review and revise accordingly.
- g. In EPA Attachment 1, Figures 1a through 7a compare the ecological COPECs relative to their background or preliminary RGOs (whichever is higher) along with their relation to lead at 400 ppm. The northwest quadrant of the graph contains the samples (parcels) which are not captured by cleanup to the lead value protective of human health (400 ppm). However, Tables 1 through 7 in EPA Attachment 2 show that the vast majority of the samples in the northwest quadrants of Figures 1a through 7a are already proposed for remediation for other non-ecological reasons. Please review this data and confirm that the analysis is correct.
- h. As mentioned on page 10-1, 35 parcels were identified as exceeding ecological preliminary RGOs, previously presented in Section 1.0. To what document does Section 1.0 refer? Section 1.0 of the March 2005 addendum does not mention the ecological preliminary RGOs. Section 1.0 of the March 2000 Work Plan was completed before the Ecological Risk Assessment finalized in 2002. Please identify the reference to Section 1.0.

Attached with these comments is EPA's analysis of those samples above the ecological preliminary RGOs but below 400 ppm, the cleanup level for lead (see Attachment 2). Based on EPA's analysis, there are clearly more parcels exceeding the ecological preliminary RGOs than the 35 identified in Table 10-1. For example, BDSB178 has aluminum above the aluminum background and iron above the iron background, but BDSB178 is not listed in Table 10-1. The same goes for BDSB104, BDSB147, and BDSB079. If EPA's analysis contained in Attachment 2 were to include those samples above the ecological preliminary RGOs without reference to a lead concentration, the number of parcels above the ecological preliminary RGOs would be even greater. Please review and explain why only 35 parcels were identified in the work plan as exceeding ecological preliminary RGOs when a greater number of parcels were identified by EPA. In other words, please confirm that Table 10-1 accurately captures all parcels above the ecological preliminary RGOs.

- i. On page 10-1, it is mentioned that 24 parcels are proposed for remediation, 9 to include additional sampling and 2 parcels not set for remediation. However, Table 10-1 only indicates Parcel 154 (i.e., BDSB180) as a no remediation parcel. One of the 25 parcels identified as proposed for remediation is actually set for no remediation. Please review and revise accordingly.

**Response:**

**Comment 4e:** The reference to Section 4.0 figures in Table 10-1 will be made clearer in the revised report. The reference will read as follows: "Brown's Dump Feasibility

Study, Revision No. 2" dated September 2004, revised February 2005. The specific figures are Figures 4-1 and 4-2. Table 10-1 has been revised to reflect this correction.

**Comment 4f:** Agree with this comment. This was an oversight, as BDSB042 and BDSB043 should not have been listed on Table 10-1. Table 10-1 has been revised to eliminate these two sample identification numbers.

**Comment 4g:** Attachment 1 provided by EPA was verified as requested. The graphs appear to be correct. If these graphs were to be included in a report, some of the chemicals need the extreme values removed, so the resolution of the majority of the samples in that particular data set can be improved for visual presentation. Only in two instances (Hg and DDT), background data were listed (sample IDs BKBD001 through BKFSS001), and these data do not appear to have been used in the plots, which is appropriate. Only in one instance higher of the two available RGOs was used (DDT, Eco RGO was 17.5 ppb compared to the higher RGO used of 43 ppb). Overall, the data plots appear accurate. These will be included in the Feasibility Study report during this revision.

**Comment 4h:** First Paragraph: The reference to Section 1.0 on page 10-1 should have been clearer in its reference to the text regarding ecological risks presented in Sections 1.0 and 2.0 of the document "Brown's Dump Feasibility Study, Revision No. 2" dated September 2004. Page 10-1 has been revised to reflect this clarification.

Second Paragraph: The proposed parcels for action are based on what was identified in the Brown's Dump Superfund Site Final Draft Ecological Risk Assessment, May 2002. The Ecological Risk Assessment report in Section 4.0 included a list of sample locations that are identified as areas needing action for ecological receptor protection. These are the lists, along with the associated parcel number, that were summarized in Table 10-1. If an area was not identified for further action for protection of ecological receptors, it was because it was not identified at the end of ecological risk assessment report as an area needing further action.

The analysis conducted by EPA that was included in their Attachment 2 to the comments was evaluated. The COPECs identified at the end of ecological risk assessment were aluminum, antimony, copper, iron, lead, zinc, mercury, and DDT. Currently planned actions already address parcels identified to have samples with exceedances for aluminum, antimony, and copper. Where as iron, mercury, and zinc were detected in some samples that are located in parcels that were not listed by the ecological risk assessment as a location of ecological concern, therefore was not included in Table 10-1. The background concentrations for most of these inorganic chemicals have a range of concentrations where maximum detected value in the background is higher than background screening value used, indicating some of the exceedances of the background could still be representative of background levels.

Upon further review of the listed exceedances identified in Attachment 2 of the EPA comments, it is noted that the samples identified for aluminum and iron in the comment are all being remediated, though not identified in Table 10-1. These are BDSB178 represents Parcel 217, which is being remediated. BDSB104 is in the Phase 1 Area (west on 33rd, third parcel on right [north side of 33rd], west of Bessie and 33rd

intersection) is slated for remediation, BDSB147 is in Parcel 157, also slated for remediation, and BDSB079 is in Parcel 700, which is the Mary McCloud Bethune School property and planned for remediation.

However, a change to the Table 10-1 is not proposed at this time, as these additional sample locations were not identified by the ecological risk assessment as areas of interest for ecological protection.

**Comment 4i:** The text will be edited to clarify, and will read as the following: "...Brown's Dump Feasibility Study, Revision No. 2, dated September 2004. As can be noted from the table, a total of 35 parcels have been originally identified to have preliminary ecological COPECs. Of these, 24 parcels are slated for remediation and nine parcels are proposed for additional sampling. Two of the parcels (Parcels 016 and 022, with samples BDAB042 and BDSB043) have been identified as having COPECs in the risk assessment. However, these parcels are located across from the Brown's Dump site, on the opposite banks of Moncrief Creek, and the remediation team agreed to not include these for further actions with other parcels at the site. Only three areas identified as exceeding ecological screening criteria, railroad track right of way, Parcel 206, and Parcel 154 that exceeds COPECs is not being addressed with the planned actions at the present time..." These are currently residential lots with no natural ecological habitat.

**Comment:**

5. **Section 10.1.1.3.1, page 10-2, fourth bullet:** The work plan mentions "remote parcels" and the definition is given in Figure 10-1 as those "...shown on the RI/FS Addendum September 2004." What is the September 2004 Addendum? I thought the Phase III Work Plan was the addendum. Please review and revise accordingly.

**Response:**

Agree. The definition for remote parcels provided in Figure 10-1 has been revised, as well as the text in Section 10.1.1.3.1 and Figure 1 in Appendix D.

**Comment:**

6. **Section 10.1.1.3.1, page 10-3, table:** There appear to be some parcels missing from the table on page 10-3. For example, Parcel 124 (i.e., BDSB127) and BDSB009 have BEQs above 687 ppb. There may be some others, but these were the ones EPA found. Please review and revise accordingly.

BDSB045 (i.e., BD278) is listed in this table as having arsenic less than 2 mg/kg. BD278 actually has an arsenic value of 4.1 mg/kg. Please review this discrepancy and search for other and revise accordingly.

**Response:**

First Paragraph: In accordance with the previous comments to the work plan, which stated "In calculating CPAHs, please use 1/2 the detection limit for those constituents in those samples where at least one CPAH has been detected. If a sample's CPAHs are all not detected, then utilize zero (i.e., the CPAH BEQ is zero)." Using this, the BEQs were recalculated. No CPAHs in soil borings BDSB127 and BDSB009 were

reported, therefore, BEQ values of "0" were applied. The remainders of the samples analyzed have been reviewed and there are no additional revisions to the number of parcels with BEQ exceedances.

**Comment:**

7. **Section 10.1.1.3.1, page 10-4, table:** It is assumed that the units in the table on page 10-4 for TEQ>1 are ppt; however the table needs to identify the units for the TEQ>1. Please review and revise accordingly.

**Response:**

The units reported on the table on page 10-4 should have been >1 micrograms per kilogram ( $\mu\text{g}/\text{Kg}$ ). The table has been revised to show TEQ > 1  $\mu\text{g}/\text{Kg}$ .

**Comment:**

8. **Section 10.1.1.3.1, page 10-4 and 10-5, graphs:** There are eleven samples (or parcels) above 8.82 ppt Dioxin TEQ but below 400 ppm lead and 2.1 ppm arsenic. However, 9 out of 11 of these samples (or parcels) are set for remediation for some other reason(s) (see Table 9 in Attachment 3).

**Response:**

Agree. It is assumed that EPA is requesting the reason(s) for the set for remediation designation for nine out of the eleven parcels to be listed, which are presented below:

- Three parcels are set for remediation as a result of exceedances of ash, arsenic, BEQ, and TEQ.
- Three parcels are set for remediation as a result of exceedances of ash, arsenic, and TEQ.
- Two parcels are set for remediation as a result of exceedances of TEQ.
- One parcel is set for remediation as a result of exceedances of BEQ and TEQ.

**Comment:**

9. **Section 10.1.1.3.1, page 10-5:** What is the regression equation when only the detected arsenic was used for the arsenic/dioxin correlation? Please include the graph for this regression line and the regression equation, statistics.

**Response:**

The requested additional regression analysis (with arsenic non-detect values removed) graph and the equation are included in the revised report.

**Comment:**

10. **Section 10.1.1.3.1, page 10-5:** The regression equation for lead incorrectly references arsenic (i.e.,  $\ln(\text{arsenic ppm})$  should be  $\ln(\text{lead ppm})$ ).

**Response:**

Agree. This typographical error has been corrected.

**Comment:**

11. **Section 10.1.1.3.1, page 10-6 and 10-7:** The plan states that "[h]owever, correlation evaluations will be used to determine relative extent of co-occurring TEQs based on the above correlation evaluations." EPA agrees that further sampling is needed to evaluate the correlation between dioxin TEQ and arsenic, lead, and ash. It is hoped that a sufficient correlation can be found to allow arsenic, lead, ash, or some combination of the three, to act as indicators of dioxin contamination. As stated at the end of page 10-7, part of the objective of this additional sampling is to establish whether or not a correlation exists between dioxin and lead or arsenic or ash.

**Response:**

Agree. No changes to the document.

**Comment:**

12. **Section 12.0, page 12-1:** What laboratory will be used in the analysis? In other words, is the QAPP referenced in Section 1.1, page 1-1 still valid?

**Response:**

Severn Trent Laboratories, Inc. (STL) in Tallahassee, Florida, is the laboratory that will be used for the lead and arsenic analyses using EPA Method 6010. Paradigm Analytical Laboratories, Inc. in Wilmington, North Carolina, is the laboratory that will be used for the dioxin analyses using EPA Method 8290. In further review of the QAPP that was executed in March 2000, it was noted that personnel assigned and personnel whose signatures executed the QAPP have changed. Therefore, a revised QAPP is being submitted with this addendum.

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# 1.0 Introduction

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## 1.1 Purpose

At the request of the U.S. Environmental Protection Agency (EPA) Region 4, CH2M HILL, Inc. (CH2M HILL) has prepared the Brown's Dump Additional (Phase 3) Remedial Investigation Sampling Plan (Revision 3). This sampling plan will serve as an addendum to the Work Plan (Revision 2) for the Remedial Investigation/Feasibility Study (RI/FS) for Brown's Dump Site. This plan includes additions to **Sections 10.0** and **12.0** of the approved Work Plan, Revision 2, dated February 2000. Standard Operation Procedures (SOPs) are included in **Appendix D** and the Quality Assurance Project Plan (QAPP) is provided in **Appendix F** of the Brown's Dump Work Plan. **Appendix H** presents the correlation plots for the chemicals of potential ecological concern (COPECs).

## 1.2 Work Plan Organization

This Phase 3 Additional Remedial Investigation Sampling Plan Work Plan Addendum (WPA) includes the following sections and appendixes and includes only narratives, tables, and figures that address the additional soil sampling effort.

**Section 10.0** - Standardized Field Sampling and Laboratory Analysis Strategy

**Section 12.0** - Brown's Dump Site Field Sampling Plan

**Appendix D** - Standard Operation Procedures for Field Sampling

**Appendix F** - Quality Assurance Project Plan

**Appendix H** - Correlation Plots for the COPECs

For clarity, the section numbering is consistent with the Brown's Dump Site Work Plan, Revision No. 1, February 2000.

## 10.0 Standardized Field Sampling and Laboratory Analysis Strategy

The intent of the Phase 3 field effort at the site is to complete the identification of parcels to be considered for remediation within the established boundary of the Brown's Dump Site. The evaluation of parcels will be performed through visual observation, x-ray fluorescence (XRF) screening, and laboratory analysis. Soil samples will be collected for laboratory analysis to augment previous data reported within the established site boundary. Based on this, a standardized sampling strategy will be followed at the site for soil sampling and ash identification. General sampling and decontamination procedures will be conducted according to the Environmental Protection Agency (EPA) Region IV protocols, as described in Appendix D of the Brown's Dump Site Work Plan, Revision No. 1, and this addendum. Sampling will be conducted as described in the subsections that follow.

### 10.1 Soil and Ash

#### 10.1.1 Soil and Ash Sampling Strategy

The standardized sampling strategy for soil and ash is to evaluate previously unsampled parcels and resample other parcels on a parcel-by-parcel basis. The purpose of this sampling effort is to evaluate parcels for further consideration for remediation. To minimize the number of samples for dioxin analysis to reduce costs, two strategies were evaluated: 1) sampling based on a correlation evaluation, and 2) sampling based on visual ash percentage. These strategies are described below. Also, the ecological end-point based chemicals of ecological concern (COPECs) were evaluated using the Phase 1 and Phase 2 data. The following summarizes these efforts.

##### **Correlation Evaluation**

Arsenic, lead, and ash were evaluated as potential indicators of dioxin occurrence in samples. A regression analysis was performed to determine the correlation of arsenic, lead, and ash to dioxin toxicity equivalency quotient (TEQ). The results are presented in the table below.

Predictor	Response	Log-Transformed		Intercept	Regression Coefficient
		Correlation Coefficient	R <sup>2</sup>		
Arsenic	TEQ > 1µg/kg	0.73	53%	2.28	0.73
Arsenic (Detects only)	TEQ > 1µg/kg	0.52	27%	1.27	0.86
Lead	TEQ > 1µg/kg	0.74	55%	-1.06	0.75
Ash <sup>a</sup>	TEQ > 1µg/kg	0.91	83%	-1.39	1.46

Note that R<sup>2</sup> is simply the square of the correlation coefficient.

<sup>a</sup> Results are based on limited sample size and the lack of spread in the ash percentages.

The correlation evaluations were reevaluated by dropping low-end non-detect values based on EPA comments received. However, any change in the current number of samples and their concentration distributions will change the correlation coefficients, thereby changing



the respective target limits obtained through this method. Overall, the regression analysis indicated that the correlation between TEQ versus other target analytes is not very strong. Thus, while regression analysis is a reliable indirect indicator of relative occurrence of the other target chemicals, it is not a reliable method for obtaining quantitative target limits, due to weak correlation, as well as high sensitivity to the change in the samples and their distributions. As a result, health protection-based target levels (e.g., As=2.1, Pb=400, Ash=25%) and the background levels-based target levels (e.g., TEQs=8.82 ppt; note EPA dioxin TEQ cleanup criteria is 1,000 parts per trillion [ppt]) will be used for overall achievement of remedial actions.

As a result of the low potential of arsenic, lead, or ash being reliable constituents for correlation of dioxin, a meeting was held to develop a plan for future sampling and analyses conducted at the Brown's Dump Site and Jacksonville Ash Site, which will minimize dioxin sampling while meeting the needs of the City of Jacksonville (City), EPA, and Florida Department of Environmental Protection (FDEP).

#### ***Visual Ash Percentage Evaluation***

A discussion regarding the correlations (described above) and Phase 3 sampling approach led to the verbal agreement with EPA and tentative FDEP approval that for non-airborne ash deposition zones, dioxin analyses would not be required if ash was not visually detected (i.e., equal to 0 percent). This new approach was based on how FDEP is currently considering other ash sites with similar operational history in the Jacksonville area. This concept is further detailed as follows:

- For parcels within the non-airborne ash deposition zone (encompasses the entire Brown's Dump Site), the decision to perform dioxin analysis will be based on visual ash content, XRF and/or laboratory lead analysis, and arsenic analysis from samples from the parcel in question. Dioxin analysis will be performed if ash is visually detected between 0 and 25 percent, XRF and offsite laboratory lead analysis less than 400 milligrams per kilogram (mg/kg) and arsenic less than 2.1 mg/kg.
- For parcels requiring dioxin analysis as a result of the above criteria, two composite depth interval soil samples will be analyzed: the 0- to 6-inch interval and each of the depth intervals where ash greater than 0 percent and less than 25 percent.

#### ***Chemicals of Ecological Concern Evaluation***

The COPECs are identified with parcels that are currently occupied by residences, thus offering very little or no ecological habitat for protection. **Appendix H** presents the correlation plots for the COPECs. The following sampling strategy eliminates chemicals that exceed the ecological end-points as well. Since the area is an urban environment with no significant ecological habitat, the action described below focuses on the health protection-based remedial goal options (RGOs), which coincidentally protect the terrestrial receptors as well. Thus special emphasis for protection of ecological terrestrial receptors is not made during the following discussions. As can be noted in **Table 10-1**, a total of 228 parcels have been originally identified to have preliminary ecological COPECs using the Phase 1 and Phase 2 data. Of these, 161 parcels are slated for remediation and 33 parcels are proposed for sampling. Thirty-four parcels have been identified as having COPECs in the evaluation. However, two of these parcels are located across from the Brown's Dump site on the opposite banks of Moncrief Creek, 10 are located outside of the EPA Boundary, and 22

parcels are not located adjacent to a parcel with ash or lead exceedance above criteria. The remediation team agreed to not include these for further actions along with other parcels at the site. As the proposed remedial actions for Brown's Dump site also address terrestrial ecological exposure pathways, a separate analysis for the protection of ecological receptors in the urban terrestrial ecological areas that are currently being used for residential land use purposes is not needed.

### 10.1.1.3 Additional Parcel-by-Parcel Sampling

The Phase 3 parcel-by-parcel sampling will be conducted similarly to the previous Phase 1 "Tier 2" sampling, and will be performed as two distinct and separate field events (First Field Event and Second Field Event). The purpose of the First Field Event is to evaluate the additional parcels that are located adjacent to parcels with reported exceedances of ash (greater than 25 percent) and/or lead (greater than 400 parts per million [ppm]) that are within the established boundary of the ash site. The parcels may not have previously been evaluated during the Phase 1 and Phase 2 activities, or did not exhibit exceedances of ash and/or lead and were not evaluated for arsenic and/or dioxins. The Second Field Event is a contingency sampling event. This event consists of a step-out strategy from the First Field Event. The sampling locations to be evaluated will be dependent on the results of the sampling analyses performed during the First Field Event. Each field event will consist of the following procedures.

#### 10.1.1.3.1 Phase 3 First Field Event

##### *First-Time Sampling of a Parcel*

Parcels that have not been sampled during the performance of the Phase 1 and Phase 2 activities, and are located adjacent to a parcel that have reported exceedances of ash and/or lead, will be evaluated during the Phase 3 activities (pending receipt of access agreements from the property owner before completion of the Phase 3 activities). These parcels are referred to as First-Time Sampling Parcels. A sampling and remediation decision flow chart is presented in **Figure 10-1**. The following provides additional detail on the field procedures to be followed during the performance of Phase 3 for First-Time Sampling Parcels.

- Five soil borings will be advanced (one central and four corners) for each parcel to 2 feet below land surface (bls). Individual (discrete) soil samples from each boring will be collected at the 0- to 6-inch, 6- to 12-inch, 12- to 18-inch, and 18- to 24-inch intervals.
- Each of the discrete soil samples (total of 20 per parcel) will be checked visually for ash and field screened for lead using XRF.
- The average percent-ash and -XRF lead will be calculated and recorded in the field logbook for each sample depth interval. If the average value for any sample interval exceeds 25 percent ash or XRF lead of 400 ppm, the sample interval will be considered to exceed criteria and further compositing and analysis of samples from the interval will not be performed. If an upper depth interval exceeds criteria but lower intervals do not exceed criteria, the lower intervals will be composited and further analysis performed as described below. If a deeper interval exceeds criteria but the upper interval(s) do not, further compositing and analysis of samples from the upper interval(s) will not be performed. The intent of comparing the average of the discrete samples to the criteria is to eliminate unnecessary analytical costs of composite samples.

- The discrete samples will be composited by sample depth interval (except those intervals as described above). For each depth interval, five samples will be composited, resulting in four composite samples. The composite samples will be checked visually for ash content and analyzed for XRF lead. If the individual or averages are not exceeded, composites are also not expected to exceed. This procedure provides redundancy in the field sampling effort. If the results are less than 25 percent for ash or 400 ppm for XRF lead, the composite sample will be submitted to the laboratory for analyses of lead and arsenic.
- Where one or more composite laboratory samples have lead greater than 400 ppm or arsenic greater than 2.1 ppm, the parcel will be considered for remediation. If a composite laboratory sample reports lead less than 400 ppm and arsenic less than 2.1 ppm, the sample will be analyzed for dioxins, only if the field screening indicated visual ash content in the sample is greater than 0 percent and less than 25 percent. If the field screening indicated ash is 0 percent, then no dioxin analysis will be performed.
- The parcel will be considered for remediation only to the lowest depth interval exceeding the criteria, to a maximum depth of 2 feet.

**Table 12-4** in **Section 12** of this WPA presents the proposed additional analyses for each parcel.

Polycyclic aromatic hydrocarbons (PAHs) will not be analyzed in any of the laboratory samples because they are unlikely to be related to the ash, and they are not likely to be bio-accessible if they are associated with ash. The EPA Baseline Risk Assessment (EPA, 2002) concluded that "...it is possible that CPAHs detected in surface came from sources other than ash (e.g., asphalt). If, however, the CPAHs are indeed originating from the ash, it is likely that they were incorporated into a hard matrix where they are not likely to be bio-accessible (ATSDR, 1995)."

Additionally, PAHs are occurring in the samples that also exceeded the criteria for one or more other parameters (i.e., arsenic, ash, or lead). The table below summarizes a query of the soil sample database for exceedance of benzo(a)pyrene toxicity equivalent (BEQ) criteria of 687 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ). There were only seven of a total of 51 soil samples with BEQ exceeding 687  $\mu\text{g}/\text{kg}$ .

Parcel	Samples with BEQ > 687 $\mu\text{g}/\text{kg}$	Depth Interval (ft bls)	BEQ ( $\mu\text{g}/\text{kg}$ )	Samples with BEQ > 687 $\mu\text{g}/\text{kg}$ AND As > 2 mg/kg	Samples with BEQ > 687 $\mu\text{g}/\text{kg}$ AND Ash > 25%	Samples with BEQ > 687 $\mu\text{g}/\text{kg}$ AND Pb > 400 mg/kg
BD010	BD010X0.5	0.5-1	4,494.4	BD010X0.5		
BDSB079	BDA055	3-4	1,371.42	BDA055	BDA055	BDA055
BDSB116	BDA208	7-8	1,872.3	BDA208		BDA208
BDSB058	BDA267	0-0.5	941.36	BDA267		BDA267
BDSB058	BDA268	2-2.5	2,860.2	BDA268	BDA268	BDA268
BDSB012	BDA372	4-8	2,830.5	BDA372	BDA372	BDA372
BDSB045	BDA278	0-0.5	732.96	BDA278		BDA278

Parcel	Samples with BEQ > 687 µg/kg	Depth Interval (ft bls)	BEQ (µg/kg)	Samples with BEQ > 687 µg/kg AND As > 2 mg/kg	Samples with BEQ > 687 µg/kg AND Ash > 25%	Samples with BEQ > 687 µg/kg AND Pb > 400 mg/kg
As	arsenic					
BEQ	benzo(a)pyrene toxicity equivalent					
ft bls	feet below land surface					
µg/kg	micrograms per kilogram					
mg/kg	milligrams per kilogram					
Pb	lead					

As shown in the table, all of the samples with exceedances of the BEQ criteria also exceeded criteria for arsenic. Six of the seven also exceeded for lead and three of the seven also exceeded for ash. As a result, PAH sampling is not needed because in all cases the arsenic and lead criteria serve as an indicator of PAH exceedance.

### **Resampling a Parcel**

Some of the parcels that were sampled during the Phase 1 and Phase 2 investigation that did not exceed any of the criteria for parameters analyzed will be resampled and analyzed for parameters not previously analyzed. The parcels to be resampled are those located adjacent to a parcel that exhibits exceedances above criteria for ash and/or lead. These parcels are referred to as Resampling Parcels (See Figure 10-1). The procedures are similar to those described above, with the exception that the laboratory analyses to be performed on composite samples will be based on the results from past analyses for the samples from these parcels (e.g., if lead was previously analyzed it will not be re-analyzed). The discrete samples will not need to be re-analyzed for visible ash and XRF lead, as this was previously performed at these parcels. Table 12-4 in Section 12 of this WPA presents the proposed additional analyses for each parcel.

#### **10.1.1.3.2 Phase 3 Second Field Event**

The parcels to be sampled and the analyses that will be performed during the Phase 3 Second Field Event will be determined as interpretation of the Phase 3 First Field Event field observations and/or laboratory analytical results. The field procedure for the Second Field Event will be the same as the First Field Event.

All sampling and analysis will be conducted in accordance with the approved Work Plan Revision No. 1 for Brown's Dump Site, dated February 2000, and this WPA.

### **10.1.2 Laboratory Analysis Strategy for Soil and Ash**

The standardized laboratory analysis strategy for parcel-by-parcel sampling is as described above. Additional detail is presented below:

- Lead and arsenic will be analyzed using EPA Method 6010. Currently, dioxins and furans will be analyzed using EPA Method 8290, however, several less expensive methods are being considered. If a less expensive method is proven to be technically acceptable, that method may be used in place of EPA Method 8290. Prior to implementation, the replacement method will be presented to EPA for approval

## 12.0 Brown's Dump Site Field Sampling Plan

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See the Brown's Dump Site Work Plan, Revision No. 1 (February 2000) for discussions related to site description, conceptual model, and preliminary remedial action alternatives for this project.

### 12.4 Data Collection Plan

#### 12.4.1 General Approach

The purpose of this subsection is to describe the site-specific sampling strategy for the Phase 3 parcel-by-parcel sampling that will identify parcels for remediation consideration. The standardized procedures were presented in **Section 10.0**. The goal is to meet the general data quality objectives (DQOs), as stated in Section 3 of the Work Plan. The additional site-specific DQOs for this site are listed below:

- Complete the Phase 3 evaluation, on a parcel-by-parcel basis, of the parcels adjacent to parcels with reported ash and/or lead exceedances. The parcels chosen for this effort are located within the established boundary of the site, which is not expected to change.
- Describe the nature of the ash and surface and subsurface soils.
- Evaluate the results of the field and laboratory analyses for each parcel and its consideration for remediation.

Field activities to be conducted in Phase 3 will include the following:

- Field screening (visual and x-ray fluorescence [XRF]) of ash and soil to determine the horizontal and vertical extent of the ash and lead-contaminated soil within the first 2 feet of depth.
- Collection of composite soil samples for potential laboratory analyses of lead, arsenic, and dioxins and furans.

The details of Phase 3 are presented in the following subsections.

#### 12.4.4 Phase 3 Investigation

##### 12.4.4.1 Field Screening

###### Soil/Ash

The Phase 3 field activities will include soil sampling and screening of surface and subsurface soils and ash to a maximum depth of 2 feet below ground surface, as described in **Section 10.0**. Sampling will be conducted in accordance with the Environmental Protection Agency (EPA) Region IV protocols (see **Appendix D** of this Work Plan Addendum [WPA]).

During development of the Brown's Dump Phase 3 Sampling Plan, the City of Jacksonville (City) initiated protocols to evaluate, on a parcel-by-parcel basis, those parcels that, as a result of their proximity to an area that is to be evaluated for remediation and is a residential use parcel, will be bypassed for assessment and will be considered for remediation. A total of 30 parcels are proposed for bypassing the Phase 3 sampling effort. **Table 12-5** and **Figure 12-3** present those parcels that are proposed for bypassing sampling.

A maximum of 136 parcels will be sampled during this phase of work (120 parcels during the first field event and up to 16 parcels during the contingency field event). Excluding quality control (QC) sampling, it is estimated that 364 composite soil samples will be collected and analyzed by the laboratory for lead and 532 soil samples will be analyzed for arsenic. Approximately 33 samples will be analyzed for dioxins and furans.

The number of dioxins and furans analyses was developed using the results of the Phase 2 data set for analyses performed to the 2-foot depth interval. A total of 7,329 samples were field screened for ash. Of that number 746 samples (10.18 percent) reported ash greater than 0 percent and less than 25 percent (i.e., the potential number of dioxin analyses based on the arsenic results). There were 6,291 samples (85.84 percent) with ash reported at 0 percent (i.e., the number of samples not requiring dioxin analyses). Of the 746 samples with ash greater than 0 percent and less than 25 percent, 75 samples had reported lead less than 400 parts per million (ppm) and analytical results for arsenic. Of those 74 samples analyzed for arsenic, 34 samples (45.33 percent) reported arsenic concentrations less than 2.1 ppm. When the proposed Phase 3 parcel-by-parcel sampling plan was developed for first time sampling and reevaluation of the Phase 2 parcels, this estimation of sampling and analytical outcome was applied.

**Figure 12-3** illustrates the parcels that will be considered for remediation (based on the Phase 1 and Phase 2 efforts) and proposed Phase 3 parcel-by-parcel sampling locations.

#### 12.4.5 Sampling Approach

The general sampling approach is described in **Section 10.0** of this WPA. The field sampling procedures are described in **Appendix D** of the Brown's Dump Work Plan, Revision No. 1 (February 2000) with additional details provided in **Appendix D** of this WPA. Also, the Quality Assurance Program Plan (QAPP) is included in **Appendix F** of this WPA.

#### 12.4.6 Sampling Summary

The number and types of samples proposed for collection during this effort are summarized in **Table 12-2**. **Figure 12-3** illustrates the sampling locations. Quality assurance/quality control (QA/QC) samples will be analyzed at the frequency designated in the QAPP. A summary of estimated QA/QC samples is presented in **Table 12-3**. A listing of the sampling rational on a parcel by parcel basis is presented in **Table 12-4**. Included in **Table 12-4** are those parcels and the rational for not sampling a parcel.

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**Tables**

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**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BDSB009	From the intersection of Rita and Nash, go northeast to the second parcel on the southeast side of street (adjacent to Moncrief Creek)	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB012	From the intersection of Rita and Nash, go northeast to the sixth parcel on the southeast side of street (adjacent to Moncrief Creek)	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB014	In Parcel 006	Pink	Soils Proposed for Remediation
BDSB016	In Parcel 010	Pink	Soils Proposed for Remediation
BDSB045	It is within the large asymmetrical parcel identified as Moncrief Village; this parcel is located east across the street from the JEA substation	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB046	It is within the large asymmetrical parcel identified as Moncrief Village; this parcel is located east across the street from the JEA substation	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB054	It is within the large asymmetrical parcel identified as Moncrief Village; this parcel is located east across the street from the JEA substation	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB055	It is within the large asymmetrical parcel identified as Moncrief Village; this parcel is located east across the street from the JEA substation	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB058	It is within the large asymmetrical parcel identified as Moncrief Village; this parcel is located east across the street from the JEA substation	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB124	In Parcel 133	Brown	Soils Proposed for Remediation
BDSB130	From the intersection of Connie and 33rd, go southeast to the sixth parcel on the west side of Connie	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB134	It is located on the southwest corner of Eta and 33rd	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB136	In Parcel 177	Brown	Soils Proposed for Remediation
BDSB097	From Parcel 228, it is west across the street from the north portion of parcel 228 (northwest corner of that intersection - Bessie Circle East and Bessie Circle South)	Brown	Soils Proposed for Remediation (in Phase 1 Area)



**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BDSB101	From the intersection of Bessie and 33rd, go north to the fifth parcel on west side of Bessie	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB180	In Parcel 154	White	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BDSB182	In Parcel 150	Brown	Soils Proposed for Remediation
BDSB039	In Parcel 003	Pink	Soils Proposed for Remediation
BDSB040	In Parcel 004	Pink	Soils Proposed for Remediation
BDSB041	In Parcel 003	Pink	Soils Proposed for Remediation
BDSB149	In Parcel 160	Brown	Soils Proposed for Remediation
BDSB189	In Parcel 078	Green	Additional Sampling for COCs
BDSB307	In Parcel 233	Green	Additional Sampling for COCs
BDSB066	In Parcel 032	Green	Additional Sampling for COCs
BDSB108	In Parcel 232	Brown	Soils Proposed for Remediation
BDSB304	From the intersection of Spires and 33rd, go west to first road on left (Leonard) and turn south to the third parcel on the west side of Leonard	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB345	In Parcel 265	Green	Additional Sampling for COCs
BDSB111	In Parcel 289	Green	Additional Sampling for COCs
BDSB078	In Parcel 047	Green	Additional Sampling for COCs
BDSB085	In Parcel 700	Pink	Soils Proposed for Remediation (in Mary McCleod Bethune Elementary School Property)
BDSB110	In Parcel 293	Green	Additional Sampling for COCs
BDSB170	In Parcel 206	Brown	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BDSB311	In Parcel 317	Brown	Soils Proposed for Remediation
BD001	Parcel 001	Green	Soils Proposed for Remediation
BD002	Parcel 002	Pink	Soils Proposed for Remediation
BD003	Parcel 003	Pink	Soils Proposed for Remediation
BD004	Parcel 004	Pink	Soils Proposed for Remediation
BD005	Parcel 005	Pink	Soils Proposed for Remediation

**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BD006	Parcel 006	Pink	Soils Proposed for Remediation
BD007	Parcel 007	Pink	Soils Proposed for Remediation
BD009	Parcel 009	Pink	Soils Proposed for Remediation
BD010	Parcel 010	Pink	Soils Proposed for Remediation
BD012	Parcel 012	Pink	Soils Proposed for Remediation
BD013	Parcel 013	Pink	Soils Proposed for Remediation
BD015	Parcel 015	Brown	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD016	Parcel 016	Green	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD020	Parcel 020	Green	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD022	Parcel 022	Green	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD024	Parcel 024	Brown	Additional Sampling for COCs
BD030	Parcel 030	Brown	Soils Proposed for Remediation
BD031	Parcel 031	Green	Soils Proposed for Remediation
BD032	Parcel 032	Green	Additional Sampling for COCs
BD033	Parcel 033	Green	Additional Sampling for COCs
BD035	Parcel 035	Brown	Soils Proposed for Remediation
BD039	Parcel 039	Brown	Soils Proposed for Remediation
BD040	Parcel 040	Brown	Soils Proposed for Remediation
BD041	Parcel 041	Brown	Soils Proposed for Remediation
BD042	Parcel 042	Brown	Soils Proposed for Remediation
BD043	Parcel 043	Brown	Soils Proposed for Remediation
BD045	Parcel 045	Brown	Soils Proposed for Remediation
BD049	Parcel 049	Brown	Soils Proposed for Remediation
BD051	Parcel 051	Green	Additional Sampling for COCs
BD054	Parcel 054	Green	Additional Sampling for COCs
BD059	Parcel 059	Green	Contingent Additional Sampling for COCs
BD061	Parcel 061	Brown	Soils Proposed for Remediation

**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BD066	Parcel 066	Brown	Soils Proposed for Remediation
BD067	Parcel 067	Brown	Sampling for COCs
BD068	Parcel 068	Brown	Soils Proposed for Remediation
BD070	Parcel 070	Brown	Soils Proposed for Remediation
BD071	Parcel 071	Brown	Soils Proposed for Remediation
BD076	Parcel 076	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD078	Parcel 078	Green	Sampling for COCs
BD081	Parcel 081	Brown	Soils Proposed for Remediation
BD082	Parcel 082	Brown	Soils Proposed for Remediation
BD085	Parcel 085	Brown	Soils Proposed for Remediation
BD086	Parcel 086	Green	No Resampling Proposed (not adjacent to parcel with ash or lead exceedance)
BD090	Parcel 090	Brown	Soils Proposed for Remediation
BD091	Parcel 091	Brown	Soils Proposed for Remediation
BD093	Parcel 093	Brown	Soils Proposed for Remediation
BD094	Parcel 094	Brown	Soils Proposed for Remediation
BD096	Parcel 096	Brown	Additional Sampling for COCs
BD099	Parcel 099	Green	Soils Proposed for Remediation
BDSB104	From the intersection of Bessie Circle and 33 <sup>rd</sup> , go west on 33 <sup>rd</sup> to the third parcel on the north side of street (just before Moncrief Creek)	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BD 105	Parcel 105	Brown	Soils Proposed for Remediation
BDSB334	In boundary between the two parcels bound by Leonard Circle East and Leonard Court West	Brown	Soils Proposed for Remediation (In Phase 1 Area)
BDSB325	From the intersection of Leonard Circle East and Leonard Court West, go southeast to the second parcel on the east side	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BD 111	Parcel 111	Brown	Soils Proposed for Remediation
BDSB125	From the intersection of Pearce and Connie, go west on Connie to the alley south of the fourth parcel on the south side of Connie	Green	Soils Proposed for Remediation (in Phase 1 Area)

**TABLE 10-1**  
**Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation**

<b>Sample Location ID</b>	<b>Location of the Sample in a Parcel</b>	<b>Color Coding</b>	<b>Status</b>
BD 113	Parcel 113	Brown	Soils Proposed for Remediation
BD 114	Parcel 114	Brown	Soils Proposed for Remediation
BD 115	Parcel 115	Brown	Soils Proposed for Remediation
BDSB177	Adjacent to the east of Parcel 089	White	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD 116	Parcel 116	Brown	Soils Proposed for Remediation
BDSB186	Adjacent to the east of Parcel 089	White	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD 118	Parcel 118	Brown	Soils Proposed for Remediation
BD 121	Parcel 121	Brown	Soils Proposed for Remediation
BD 124	Parcel 124	Brown	Sampling for COCs
BD 126	Parcel 126	Brown	Soils Proposed for Remediation
BD 127	Parcel 127	Brown	Soils Proposed for Remediation
BD 129	Parcel 129	Brown	Sampling for COCs
BD 130	Parcel 130	Brown	Soils Proposed for Remediation
BD 132	Parcel 132	Brown	Soils Proposed for Remediation
BD 133	Parcel 133	Brown	Soils Proposed for Remediation
BD 134	Parcel 134	Brown	Additional Sampling for COCs
BD 135	Parcel 135	Brown	Soils Proposed for Remediation
BD 140	Parcel 140	Brown	Soils Proposed for Remediation
BD 141	Parcel 141	Brown	Soils Proposed for Remediation
BD 143	Parcel 143	Brown	Soils Proposed for Remediation
BD 144	Parcel 144	Brown	Soils Proposed for Remediation
BD 145	Parcel 145	Brown	Soils Proposed for Remediation
BD 146	Parcel 146	Brown	Sampling for COCs
BD 147	Parcel 147	Brown	Soils Proposed for Remediation
BD 148	Parcel 148	Brown	Soils Proposed for Remediation
BD 149	Parcel 149	Brown	Soils Proposed for Remediation
BD 150	Parcel 150	Brown	Soils Proposed for Remediation
BD 152	Parcel 152	White	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary

**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

<b>Sample Location ID</b>	<b>Location of the Sample in a Parcel</b>	<b>Color Coding</b>	<b>Status</b>
BD 154	Parcel 154	White	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD 155	Parcel 155	Brown	Soils Proposed for Remediation
BD 156	Parcel 156	Brown	Soils Proposed for Remediation
BD 157	Parcel 157	Brown	Soils Proposed for Remediation
BD 158	Parcel 158	Brown	Soils Proposed for Remediation
BD 160	Parcel 160	Brown	Soils Proposed for Remediation
BD 161	Parcel 161	Brown	Soils Proposed for Remediation
BD 162	Parcel 162	Brown	Soils Proposed for Remediation
BD 163	Parcel 163	Brown	Soils Proposed for Remediation
BD 164	Parcel 164	Brown	Soils Proposed for Remediation
BD 165	Parcel 165	Brown	Soils Proposed for Remediation
BD 166	Parcel 166	Brown	Soils Proposed for Remediation
BD 167	Parcel 167	Green	Soils Proposed for Remediation
BD 168	Parcel 168	Brown	Soils Proposed for Remediation
BD 172	Parcel 172	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 175	Parcel 175	Brown	Soils Proposed for Remediation
BD 176	Parcel 176	Brown	Soils Proposed for Remediation
BD 178	Parcel 178	Brown	Soils Proposed for Remediation
BD 186	Parcel 186	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 189	Parcel 189	Green	Soils Proposed for Remediation
BD 192	Parcel 192	Brown	Soils Proposed for Remediation
BD 195	Parcel 195	Brown	Soils Proposed for Remediation
BD 196	Parcel 196	Brown	Contingency Additional Sampling for COCs
BD 200	Parcel 200	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 206	Parcel 206	Brown	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)

**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BD 210	Parcel 210	White	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 211	Parcel 211	Brown	Soils Proposed for Remediation
BD 212	Parcel 212	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 217	Parcel 217	Brown	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 223	Parcel 223	Brown	Soils Proposed for Remediation
BD 224	Parcel 224	Brown	Soils Proposed for Remediation
BD 225	Parcel 225	Brown	Soils Proposed for Remediation
BD 226	Parcel 226	Brown	Soils Proposed for Remediation
BD 227	Parcel 227	Brown	Soils Proposed for Remediation
BD 229	Parcel 229	Brown	Soils Proposed for Remediation
BD 230	Parcel 230	Brown	Additional Sampling for COCs
BD 231	Parcel 231	Brown	Soils Proposed for Remediation
BD 232	Parcel 232	Brown	Sampling for COCs
BD 233	Parcel 233	Green	Additional Sampling for COCs
BD 234	Parcel 234	Brown	Soils Proposed for Remediation
BD 239	Parcel 239	Brown	Soils Proposed for Remediation
BD 241	Parcel 241	Brown	Sampling for COCs
BD 242	Parcel 242	Brown	Soils Proposed for Remediation
BD 243	Parcel 243	Brown	Soils Proposed for Remediation
BD 244	Parcel 244	Brown	Soils Proposed for Remediation
BD 245	Parcel 245	Brown	Soils Proposed for Remediation
BD 250	Parcel 250	Green	Additional Sampling for COCs
BD 252	Parcel 252	Brown	Soils Proposed for Remediation
BD 253	Parcel 253	Brown	Soils Proposed for Remediation
BD 256	Parcel 256	Brown	Additional Sampling for COCs
BD 258	Parcel 258	Brown	Soils Proposed for Remediation
BD 260	Parcel 260	Brown	Soils Proposed for Remediation
BD 265	Parcel 265	Green	Additional Sampling for COCs

**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BD 269	Parcel 269	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 278	Parcel 278	Brown	Soils Proposed for Remediation
BD 280	Parcel 280	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 281	Parcel 281	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 288	Parcel 288	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 290	Parcel 290	Pink	Soils Proposed for Remediation
BD 291	Parcel 291	Pink	Soils Proposed for Remediation
BD 292	Parcel 292	Pink	Soils Proposed for Remediation
BD 297	Parcel 297	Brown	Soils Proposed for Remediation
BD 302	Parcel 302	Brown	Soils Proposed for Remediation
BD 306	Parcel 306	Green	Additional Sampling for COCs
BD 308	Parcel 308	Brown	Soils Proposed for Remediation
BD 312	Parcel 312	Brown	Soils Proposed for Remediation
BD 317	Parcel 317	Brown	Soils Proposed for Remediation
BD 318	Parcel 318	Brown	Soils Proposed for Remediation
BD 319	Parcel 319	Brown	Sampling for COCs
BD 321	Parcel 321	Brown	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 322	Parcel 322	Green	Additional Sampling for COCs
BD 327	Parcel 327	Brown	Soils Proposed for Remediation
BD 345	Parcel 345	Brown	Soils Proposed for Remediation
BD 347	Parcel 347	Brown	Soils Proposed for Remediation
BD 350	Parcel 350	Brown	Soils Proposed for Remediation
BD 351	Parcel 351	Brown	Soils Proposed for Remediation
BD 352	Parcel 352	Brown	Soils Proposed for Remediation
BD 358	Parcel 358	Brown	Soils Proposed for Remediation
BD 364	Parcel 364	Brown	Soils Proposed for Remediation

**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BD 372	Parcel 372	Green	Additional Sampling for COCs
BD 373	Parcel 373	Brown	Soils Proposed for Remediation
BD 374	Parcel 374	Brown	Soils Proposed for Remediation
BD 377	Parcel 377	Brown	Soils Proposed for Remediation
BD 386	Parcel 386	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 388	Parcel 388	Brown	Soils Proposed for Remediation
BD 390	Parcel 390	Green	Soils Proposed for Remediation
BD 395	Parcel 395	Brown	Soils Proposed for Remediation
BD 397	Parcel 397	Brown	Soils Proposed for Remediation
BD 412	Parcel 412	Green	No Remediation or Additional Sampling for COCs Proposed – Parcel Outside of EPA Boundary
BD 700	Parcel 700	Pink	Soils Proposed for Remediation (in Mary McCleod Bethune Elementary School Property)
BD 701	Parcel 701	Brown	Soils Proposed for Remediation
BD 702	Parcel 702	Brown	Soils Proposed for Remediation
BD 703	Parcel 703	Brown	Soils Proposed for Remediation
BD 704	Parcel 704	Brown	Soils Proposed for Remediation
BD 705	Parcel 705	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 706	Parcel 706	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 707	Parcel 707	Green	Soils Proposed for Remediation
BD 708	Parcel 708	Green	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)
BD 709	Parcel 709	Green	No Additional Sampling for COCs Proposed – (not adjacent to parcel with ash or lead exceedance)
BDSB077/ BD 731	Parcel 731	White	Contingency Sampling for COCs
BDSB113/ BD 732	Parcel 732	White	No Additional Sampling for COCs Proposed (not adjacent to parcel with ash or lead exceedance)



**TABLE 10-1**  
Ecological RGO Exceedance Samples, Parcels, and Status at the End of Feasibility Study Implementation

Sample Location ID	Location of the Sample in a Parcel	Color Coding	Status
BDSB347	Parcel at the south corner of the intersection of Nash and Glenvale	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB012	From the intersection of Nash and Glenvale, go southwest on Nash to the fourth parcel on the south side (adjacent to the east to Moncrief Creek)	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB011	From the intersection of Nash and Glenvale, go southwest on Nash to the fifth parcel on the south side	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB045, BDSB046, BDSB049, BDSB054, BDSB055, & BDSB058	The parcel located at the southeast corner of 41 <sup>st</sup> and Spring Grove	White	No Remediation or Additional Sampling for COCs Proposed – Not within EPA Boundary for Remediation
BDSB009	From the intersection of Nash and Glenvale, go southwest on Nash to the eighth parcel on the south side (adjacent to the east to Moncrief Creek)	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB007	From the intersection of Nash and Glenvale, go southwest on Nash to the ninth parcel on the south side	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB081	In the JEA Substation Area at the Southeast Corner of Pearce and the railroad tracks	White	No Remediation or Additional Sampling for COCs Proposed – Not within EPA Boundary for Remediation
BDSB004	From the intersection of Nash and Dodge, go east on Nash to the fourth parcel on the south side	Brown	Soils Proposed for Remediation (in Phase 1 Area)
BDSB110	From the intersection of Dodge and the railroad tracks, go southwest along north side of the railroad tracks to the third parcel	White	No Remediation or Additional Sampling for COCs Proposed – Outside of EPA Boundary
BDSB098	Between the northwest corner of Parcel 228 and the southwest corner of the Phase 1 parcel adjacent to the north of Parcel 228	Green	Soils Proposed for Remediation (in Phase 1 Area)
BDSB097	From the intersection of Bessie Circle East and Bessie Circle South (in the ROW), go to the first parcel on the north side of Bessie Circle East	Brown	Soils Proposed for Remediation (in Phase 1 Area)

Color Coding in Section 4.0 Figures of the Feasibility Study (May 2005)

**TABLE 12-2**  
**Samples to be Collected for the Brown's Dump Site**  
*City of Jacksonville Ash Disposal Sites RI/FS Work Plan*

Lab Analysis	Parcels 1 <sup>st</sup> Time Sample and Resample	Borings	XRF Pb (approximately 20 samples per parcel)	Laboratory Lead (Pb) Samples	Laboratory Arsenic Samples	Dioxins/Furans Samples
<b>Phase 3 Initial Field Event</b>						
Soil/Ash	120	600	1,620 <sup>a</sup>	324 <sup>b</sup>	532 <sup>c</sup>	31 <sup>d</sup>
<b>Phase 3 Additional Field Event</b>						
Soil/Ash	16	80	200 <sup>e</sup>	40 <sup>f</sup>	56 <sup>g</sup>	2 <sup>d</sup>

<sup>a</sup> – Assumes 81 First Time Sampling parcels (Table 12-4), five borings per parcel, four samples per boring

<sup>b</sup> – Assumes 81 First Time Sampling parcels (Table 12-4), four composite samples per parcel

<sup>c</sup> – Assumes 136 First Time Sampling and Resampling (Table 12-4) parcels, four composite samples per parcel

<sup>d</sup> – Assumes that 8.4 percent of the samples will require dioxin and furans analyses (using Phase 2 calculated results)

<sup>e</sup> – Assumes 10 First Time Sampling parcels (Table 12-4), five borings per parcel, four samples per boring

<sup>f</sup> – Assumes 10 First Time Sampling parcels (Table 12-4), four composite samples per parcel

<sup>g</sup> – Assumes 14 First Time Sampling and Resampling parcels (Table 12-4), four composite samples per parcel

**TABLE 12-3**  
 QA/QC Analytical Program for the Brown's Dump Site  
 City of Jacksonville Ash Disposal Sites RI/FS Work Plan

<b>Lab Analysis</b>	<b>Lead</b>	<b>Arsenic</b>	<b>Dioxins/Furans</b>
<i>EPA Method</i>	<i>6010</i>	<i>6010</i>	<i>8290</i>
<b>Field Duplicates (10% of total analysis)</b>			
Phase 3 Initial Field Event	32	53	3
Phase 3 Additional Field Event	0	1	1
<b>Matrix Spike/Matrix Spike Duplicates (10% of total analysis)</b>			
Phase 3 Initial Field Event	32	53	3
Phase 3 Additional Field Event	0	1	1
<b>Equipment Blank (1 per day per field crew)</b>			
Phase 3 Initial Field Event	24	24	24
Phase 3 Additional Field Event	3	3	3
<b>Field Blank (1 per week per field crew)</b>			
Phase 3 Initial Field Event	5	5	5
Phase 3 Additional Field Event	1	1	1

Table 12-4  
Parcel Sample Justification for the Brown's Dump Site  
City of Jacksonville Ash Disposal Sites RI/FS Work Plan

Parcel ID	Exceed Ash/lead	Exceed Arsenic	Exceed BEQ	Exceed TEQ	Analysis for Ash/Lead	Analysis for Arsenic	Analysis for TEQ	Sampling Rational	First Time Sample (Blue)	Resample (Green)	Contingency Sample (Purple)
8					X	X	X	Adj to 007, 009, & 005 (A/L and As Exceed) - Bypass Sampling per City			
11	N	NA	NA	NA		X		Adj to 013 (A Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
14	N	NA	NA	NA		X		Adjacent to 013 (A, As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
24	N	NA	NA	NA		X		Adjacent to 030 (L Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
32	N	NA	NA	NA		X		Adj to 031 (D Exceed) (Ash Recorded at 0%)		1	
33	N	N	NA	NA				Near 035 (A/L Exceed) (Ash Recorded at 0%)			
34	N	NA	NA	NA		X	X	Adj to 035 (A/L Exceed)		1	
44	N	NA	NA	NA		X		Adj to 045 (A/L Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
46					X	X	X	Adj to 045 (A/L Exceed)	1		
47	N	NA	NA	NA		X	X	Adj to 035 and 345 (A/L Exceed)		1	
48					X	X	X	Adj to 039 & 040 (A/L As Exceed) & 049 (L Exceed) - Bypass Sampling per City			
50	N	NA	NA	NA		X		Adj to 049 (L Exceed) (Ash Recorded at 0%)		1	
51	N	N	NA	NA				Adj to 042 (A/L Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
52	N	NA	NA	NA		X		Adj to 049 (L Exceed) (Ash Recorded at 0%)		1	
53					X	X	X	Adj to 049 (L Exceed)	1		
54	N	NA	NA	NA		X	X	Adj to 049 (L Exceed)		1	
55	N	NA	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%)		1	
56					X	X	X	Contingent on 053			1
57					X	X	X	Contingent on 054			1
58					X	X	X	Adj to 061 (A/L, As, D & PAHs Exceed)	1		
59	N	NA	NA	NA		X	X	Contingent on 058			1
62					X	X	X	Adj to 061 (A/L, As, D & PAHs Exceed)	1		
63					X	X	X	Adj to 066 (L Exceed)	1		
64	N	N	NA	NA			X	Adj to 061 (A/L, As, D & PAHs Exceed)		1	
65					X	X	X	Adj to 061 (A/L, As, D & PAHs Exceed)	1		
67					X	X	X	Adj to 068 (A/L, As) - Bypass Sampling per City			
69	N	NA	NA	NA		X	X	Adj to 068 (A/L, As)		1	
73	N	NA	NA	NA		X	X	Contingent on 070, 359, 358, & 076			1
74	N	NA	NA	NA		X		Adj to 071 (L Exceed) (Ash Recorded at 0%)		1	
75					X	X	X	Adj to 071 (L Exceed)	1		
77					X	X	X	Adj to 082 (A/L Exceed)	1		
78					X	X	X	Adj to 082 (A/L Exceed)	1		
83					X	X	X	Adj to 082 (A/L Exceed)	1		
84	N	N	NA	NA				Adj to 126 (A/L & As Exceed) (Ash Recorded at 0%)			
87	N	NA	NA	NA		X		Adj to 090 (L Exceed) and 091 (A/L, As, D & PAHs Exceed) (Ash Recorded at 0%)		1	
88	N	NA	NA	NA		X		Adj to 091 (A/L, As, D & PAHs Exceed) (Ash Recorded at 0%)		1	
89					X	X	X	Adj to 091 (A/L, As, D & PAHs Exceed)			1

Table 12-4  
Parcel Sample Justification for the Brown's Dump Site  
City of Jacksonville Ash Disposal Sites RI/FS Work Plan

Parcel ID	Exceed Ash/lead	Exceed Arsenic	Exceed BEQ	Exceed TEQ	Analysis for Ash/Lead	Analysis for Arsenic	Analysis for TEQ	Sampling Rational	First Time Sample (Blue)	Resample (Green)	Contingency Sample (Purple)
92					X	X	X	Adj to 091 (A/L, As, D & PAHs Exceed)	1		
95					X	X	X	Adj to 094 (A/L Exceed) - Bypass Sampling per City			
96	N	N	NA	NA				Adj to 094 (A/L Exceed) (Ash Recorded at 0%)			
103	N	NA	NA	NA		X		Adj to 113 (A/L & As Exceed) (Ash Recorded at 0%)		1	
104	N	NA	NA	NA		X		Adj to 105 (L Exceed) (Ash Recorded at 0%)		1	
106					X	X	X	Adj to 105 (L Exceed) and 115 (A/L & As Exceed)	1		
107	N	NA	NA	NA		X		Adj to 115 (A/L & As Exceed) (Ash Recorded at 0%)		1	
108					X	X	X	Adj to 093 & 094 (A/L Exceed)	1		
109	N	NA	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%) - Bypass Sampling per City			
110	N	NA	NA	NA		X		Adj to 116 (A/L & As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
112					X	X	X	Adj to 113 and 114 (A/L & As Exceed) and Phase 1 Area - Bypass Sampling per City			
117					X	X	X	Adj to 116 (A/L & As Exceed) and Phase 1 Area - Bypass Sampling per City			
119					X	X	X	Adj to 118 (A/L Exceed) & 113 (A/L & As Exceed) - Bypass Sampling per City			
120					X	X	X	Adj to 121 (A/L, As, & PAHs Exceed) & 113 (A/L & As Exceed) - Bypass Sampling per City			
122	N	NA	NA	NA		X	X	Adj to 121 (A/L, As, & PAHs Exceed) & 130 (A/L & As Exceed)		1	
123					X	X	X	Adj to 129 (A/L, As Exceed)	1		
124					X	X	X	Adj to 127 (As Exceed)	1		
125					X	X	X	Adj to 126 (A/L & As Exceed)	1		
128					X	X	X	Adj to 129 (A/L, As Exceed) - Bypass Sampling per City			
131					X	X	X	Adj to 130 & 132 (A/L, As Exceed), 121 (A/L, As, & PAHs Exceed) - Bypass Sampling per City			
134	N	N	NA	NA				Adj to 133 and 135 (Identified for Remediation - A/L & As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
137	N	NA	NA	NA		X		Adj to 132 (A/L & As Exceed) (Ash Recorded at 0%)		1	
138					X	X	X	Adj to 132 (A/L & As Exceed) & 150 (A/L & PAHs Exceed)	1		
139					X	X	X	Adj to 140 (L & As Exceed) & 150 (A/L & PAHs Exceed)	1		
142					X	X	X	Adj to 141 & 143 (L & As Exceed) & 147 (A/L & As Exceed) - Bypass Sampling per City			
146					X	X	X	Adj to 147 & 364 (A/L & As Exceed) & 145 (A/L Exceed) - Bypass Sampling per City			
151	N	NA	NA	NA		X	X	Adj to 150 (A/L, D & PAHs Exceedance)		1	
159					X	X	X	Adj to 158 (A/L & As Exceed) & 160 (L Exceed) - Bypass Sampling per City			
169	N	NA	NA	NA		X		Adj to 167 & 168 (As Exceed) (Ash Recorded at 0%)		1	
173	N	NA	NA	NA		X		Adj to Phase 1 (Ash Recorded at 0%)		1	
174	N	N	NA	NA			X	Adj to 175 (A/L Exceed)		1	
177	N	NA	NA	NA		X		Adj to 176 (As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
179	N	NA	NA	NA		X	X	Adj to Phase 1 Area - No previous As, D or PAHs analyses		1	
180					X	X	X	Adj to 118 (A/L Exceed)	1		

Table 12-4  
Parcel Sample Justification for the Brown's Dump Site  
City of Jacksonville Ash Disposal Sites RI/FS Work Plan

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Parcel ID	Exceed Ash/lead	Exceed Arsenic	Exceed BEQ	Exceed TEQ	Analysis for Ash/Lead	Analysis for Arsenic	Analysis for TEQ	Sampling Rational	First Time Sample (Blue)	Resample (Green)	Contingency Sample (Purple)
181					X	X	X	Adj to 135 (A/L Exceed)	1		
182	N	NA	NA	NA		X	X	Adj to 135 (A/L Exceed)		1	
196	N	N	NA	NA				Contingent on 246 and 247 (Ash Recorded at 0%) - Bypass Sampling per City			
197					X	X	X	Adj to 258 (L Exceed)	1		
228	N	NA	NA	NA		X		Adj to 227 & 229 (A/L & As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
230	N	NA	NA	NA		X		Adj to 227, 226 & 229 (A/L & As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
232					X	X	X	Adj to 225 (A/L, As Exceed) & 231 (L Exceed) - Bypass Sampling per City			
233	N	NA	NA	NA		X		Adj to 223 (L&As Exceed) & 234 (A/L & As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
235	N	NA	NA	NA		X		Adj to Phase 1 Area - No previous As analysis (Ash Recorded at 0%)		1	
236					X	X	X	Adj to Phase 1 Area	1		
237	N	NA	NA	NA		X	X	Adj to 234 (A/L & As Exceed)		1	
238					X	X	X	Adj to 234 (A/L & As Exceed)	1		
240	N	NA	NA	NA		X	X	Adj to 239 (A/L Exceed)		1	
241					X	X	X	Adj to 253 (A/L Exceed) & 242 (A/L & As Exceed)	1		
246					X	X	X	Adj to 245 (A/L Exceed)	1		
247					X	X	X	Adj to 195 (As Exceed) & 258 (L Exceed)	1		
248					X	X	X	Adj to 258 (L Exceed)	1		
249	N	NA	NA	NA		X	X	Adj to 245 (A/L Exceed)		1	
250	N	NA	NA	NA		X		Adj to 245 (A/L Exceed) (Ash Recorded at 0%)		1	
251					X	X	X	Adj to 252 (A/L & As Exceed) and 244 (A/L Exceed)	1		
254					X	X	X	Adj to Phase 1 Area	1		
255	N	NA	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%)		1	
256	N	N	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%)		1	
259	N	NA	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%) - Bypass Sampling per City			
265	N	NA	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%)		1	
266					X	X	X	Adj to Phase 1 Area	1		
267	N	NA	NA	NA		X		Adj to Phase 1 Area (Ash Recorded at 0%)		1	
268	N	N	NA	NA				Adj to Phase 1 Area (Ash Recorded at 0%)			
289	N	NA	NA	NA		X		Adj to 290 (A/L & As Exceed) (Ash Recorded at 0%)		1	
293	N	NA	NA	NA		X	X	Adj to 290 & 291 (A/L & As Exceed)		1	
294	N	NA	NA	NA		X	X	Adj to 291 (A/L & As Exceed)		1	
295	N	NA	NA	NA		X	X	Contingent on 294, 296, &/or 300			1
296					X	X	X	Adj to 297 (A/L Exceed)	1		
298					X	X	X	Adj to 297& 377 (L Exceed) & 302 (L & As Exceed) - Bypass Sampling per City			
299					X	X	X	Adj to 291 (A/L & As Exceed)	1		
300					X	X	X	Adj to 291 (A/L Exceed) & 308 (L & As Exceed)	1		
301					X	X	X	Adj to 291 (A/L & As Exceed) and 302 (L Exceed)	1		
303	N	NA	NA	NA		X		Contingent on 315 (Ash Recorded at 0%)			1
304					X	X	X	Per EPA - Previous Access Not Given	1		

Table 12-4  
Parcel Sample Justification for the Brown's Dump Site  
City of Jacksonville Ash Disposal Sites RI/FS Work Plan

Parcel ID	Exceed Ash/lead	Exceed Arsenic	Exceed BEQ	Exceed TEQ	Analysis for Ash/Lead	Analysis for Arsenic	Analysis for TEQ	Sampling Rational	First Time Sample (Blue)	Resample (Green)	Contingency Sample (Purple)
305					X	X	X	Per EPA - Previous Access Not Given	1		
306	N	N	NA	NA				Adj to 302 (L & As Exceed) (Ash Recorded at 0%)			
307					X	X	X	Adj to 308 (L & As Exceed)	1		
309	N	NA	NA	NA		X	X	Adj to 308 (L & As Exceed)		1	
310					X	X	X	Adj to 308 (L & As Exceed) and 312 (A & As Exceed)	1		
311					X	X	X	Adj to 308 (L & As Exceed) and 312 (A & As Exceed)	1		
313	N	NA	NA	NA		X	X	Adj to 317 (A/L Exceed)		1	
314					X	X	X	Adj to 318 (A/L Exceed)	1		
315					X	X	X	Adj to 318 (A/L Exceed)	1		
316	N	N	NA	NA				Contingent on 315 (Ash Recorded at 0%)			
319					X	X	X	Adj to 318 (A/L/ Exceed)	1		
320					X	X	X	Adj to 318 (A/L/ Exceed)	1		
322	N	NA	NA	NA		X	X	Per EPA		1	
323					X	X	X	Per EPA - Previous Access Not Given	1		
324	N	NA	NA	NA		X	X	1st Level Contingency on 325 results			1
325					X	X	X	Contingent on 324			1
326					X	X	X	Contingent on 322			1
328					X	X	X	Adj to 318 (A/L/ Exceed)	1		
330					X	X	X	Adj to 704 (A/L/ Exceed)	1		
331					X	X	X	Adj to 704 (A/L/ Exceed)	1		
334	N	N	NA	NA				Contingent on 336 &/or 337 (Ash Recorded at 0%)			
335					X	X	X	Adj to 704 (A/L/ Exceed)	1		
336					X	X	X	Adj to 704 (A/L/ Exceed)	1		
337					X	X	X	Adj to 397 (A/L & As Exceed) & 390 (D Exceed)	1		
339	N	N	NA	NA				Adj to 397 (A/L & As Exceed) & 390 (D Exceed) (Ash Recorded at 0%)			
340					X	X	X	Adj to 327 & 338 (A/L Exceed)	1		
341					X	X	X	Contingent on 340 &/or 343			1
342					X	X	X	Adj to 327 (A/L Exceed)	1		
344					X	X	X	Adj to 318 (A/L/ Exceed)	1		
346	N	N	NA	NA				Adj to 345 (A/L & As Exceed) (Ash Recorded at 0%) - Bypass Sampling per City			
348					X	X	X	Adj to 347 (As Exceed)	1		
349					X	X	X	Adj to 350 (A/L Exceed)	1		
353					X	X	X	Adj to 352 (A Exceed) and 045 (A/L Exceed)	1		
354					X	X	X	Adj to 066 (L Exceed)	1		
355					X	X	X	Contingent on 354 results			1
356					X	X	X	Adj to 071 (L Exceed) & 358 (A/L Exceed)	1		
357					X	X	X	Adj to 358 (A/L Exceed)	1		
359					X	X	X	Adj to 071 (L Exceed) & 358 (A/L Exceed)	1		
361	N	N	NA	NA				Contingent on 362 and 363 results (Ash Recorded at 0%)			
362					X	X	X	Adj to 374 (A/L, As, & PAHs Exceed)	1		
363					X	X	X	Adj to 374 (A/L, As, & PAHs Exceed) & 364 (A/L & As Exceed) - Bypass Sampling per City			
365					X	X	X	Adj to 364 (A/L & As Exceed)	1		

Table 12-4

Parcel Sample Justification for the Brown's Dump Site  
City of Jacksonville Ash Disposal Sites RI/FS Work Plan

Parcel ID	Exceed Ash/Lead	Exceed Arsenic	Exceed BEQ	Exceed TEQ	Analysis for Ash/Lead	Analysis for Arsenic	Analysis for TEQ	Sampling Rational	First Time Sample (Blue)	Resample (Green)	Contingency Sample (Purple)
366					X	X	X	Adj to 148 (A/L, As, D & PAHs Exceed)	1		
367					X	X	X	Adj to 149 (A/L Exceed)	1		
368					X	X	X	Adj to 150 (A/L, D & PAHs Exceed)	1		
369					X	X	X	Complete Block	1		
370					X	X	X	Complete Block	1		
372	N	N	NA	NA				Adj to 373 (A Exceed) (Ash Recorded at 0%)			
375					X	X	X	Contingent on 376			1
376					X	X	X	Adj to 258 (L Exceed)	1		
378	N	N	NA	NA				Adj to 377 (A/L Exceed) (Ash Recorded at 0%)			
379					X	X	X	Near 377 (A/L Exceed) & 302 (L & As Exceed) - Per EPA	1		
380					X	X	X	Adj to 377 (A/L Exceed) & 302 (L & As Exceed)	1		
387	N	N	NA	NA			X	Contingent on 340, 389, &/or 392			1
389					X	X	X	Adj to 388 (A/L Exceed)	1		
391					X	X	X	Adj to 397 (A/L & As Exceed)	1		
392	N	NA	NA	NA		X		Adj to 397 (A/L & As Exceed) (Ash Recorded at 0%)		1	
393					X	X	X	Adj to 395 (L Exceed)			1
394	N	N	NA	NA				Contingent on 341 &/or 393 (Ash Recorded at 0%)			
396					X	X	X	Adj to 397 (A/L & As Exceed) & 395 (L Exceed)	1		
398					X	X	X	Adj to 395 (L Exceed)	1		
400					X	X	X	Adj to 352 (A Exceed)	1		
401	N	N	NA	NA				Adj to 045 (A/L Exceed) (Ash Recorded at 0%)			
402					X	X	X	Per EPA	1		
403					X	X	X	Adj to 066 (L Exceed)	1		
405					X	X	X	Adj to 091 (A/L, As, D & P Exceed)	1		
406					X	X	X	Adj to 150 (A/L, D & PAHs Exceed)	1		
408	N	N	NA	NA				Adj to 297 (A/L Exceed) (Ash Recorded at 0%)			
411	N	N	NA	NA				Adj to 297 (A/L Exceed) (Ash Recorded at 0%)			
731					X	X	X	Contingent on 051 &/or 401			1
734					X	X	X	Adjacent to 395 (L Exceed)	1		
735					X	X	X	Adj to 397 (A/L & As Exceed)	1		
Totals ### ##									81	39	16

A	= Exceeds Ash Only
A/L	= Exceeds Ash and Lead
L	= Exceeds Lead Only (XRF &/or Lab Analysis)
As	= Exceeds Arsenic
BEQ	= Benzo (a) pyrene Equivalent (PAHs)
TEQ	= Toxicity Equivalent (Dioxins)
	= Proposed for Remediation Bypassing Proposed Phase 3 Sampling (Not in Count)

N = No Exceedance  
Y = Exceedance  
NA = Not Analyzed



## Brown's Dump Site

Table 12-5: Parcels Proposed for Remediation Bypassing Proposed Phase 3 Sampling - Based on Client Internal Decisions

Parcel ID*	Ownership/Reasoning	Current Status	Current Proposed Sampling		
			Ash/Pb	Arsenic	TEQ
008	COJ/Very small parcel (0.02 acres)	1st Time Sample	X	X	X
011	Residential/Surrounded by Remediate	Resample		X	X
014	Residential/Surrounded by Remediate	Resample		X	X
024	Residential/Surrounded by Remediate	Resample		X	X
044	Residential/Surrounded by Remediate	Resample		X	X
048	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
067	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
095	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
109	Residential/Surrounded by Remediate	Resample		X	X
110	Residential/Surrounded by Remediate	Resample		X	X
112	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
117	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
119	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
120	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
128	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
131	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
134	Residential/Surrounded by Remediate	Resample			X
142	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
146	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
159	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
177	Residential/Surrounded by Remediate	Resample		X	X
196	Residential/Surrounded by Remediate	Contingency			X
228	Residential/Surrounded by Remediate	Resample		X	X
230	Residential/Surrounded by Remediate	Resample		X	X
232	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
233	Residential/Surrounded by Remediate	Resample		X	X

**Brown's Dump Site****Table 12-5: Parcels Proposed for Remediation Bypassing Proposed Phase 3 Sampling - Based on Client Internal Decisions**

Parcel ID*	Ownership/Reasoning	Current Status	Current Proposed Sampling		
			Ash/Pb	Arsenic	TEQ
259	Residential/Surrounded by Remediate	Resample		X	X
298	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
346	Residential/Surrounded by Remediate	Resample			X
363	Residential/Surrounded by Remediate	1st Time Sample	X	X	X
Parcel Total = 30		Number of Lab Analyses (per parcel)	16	27	30

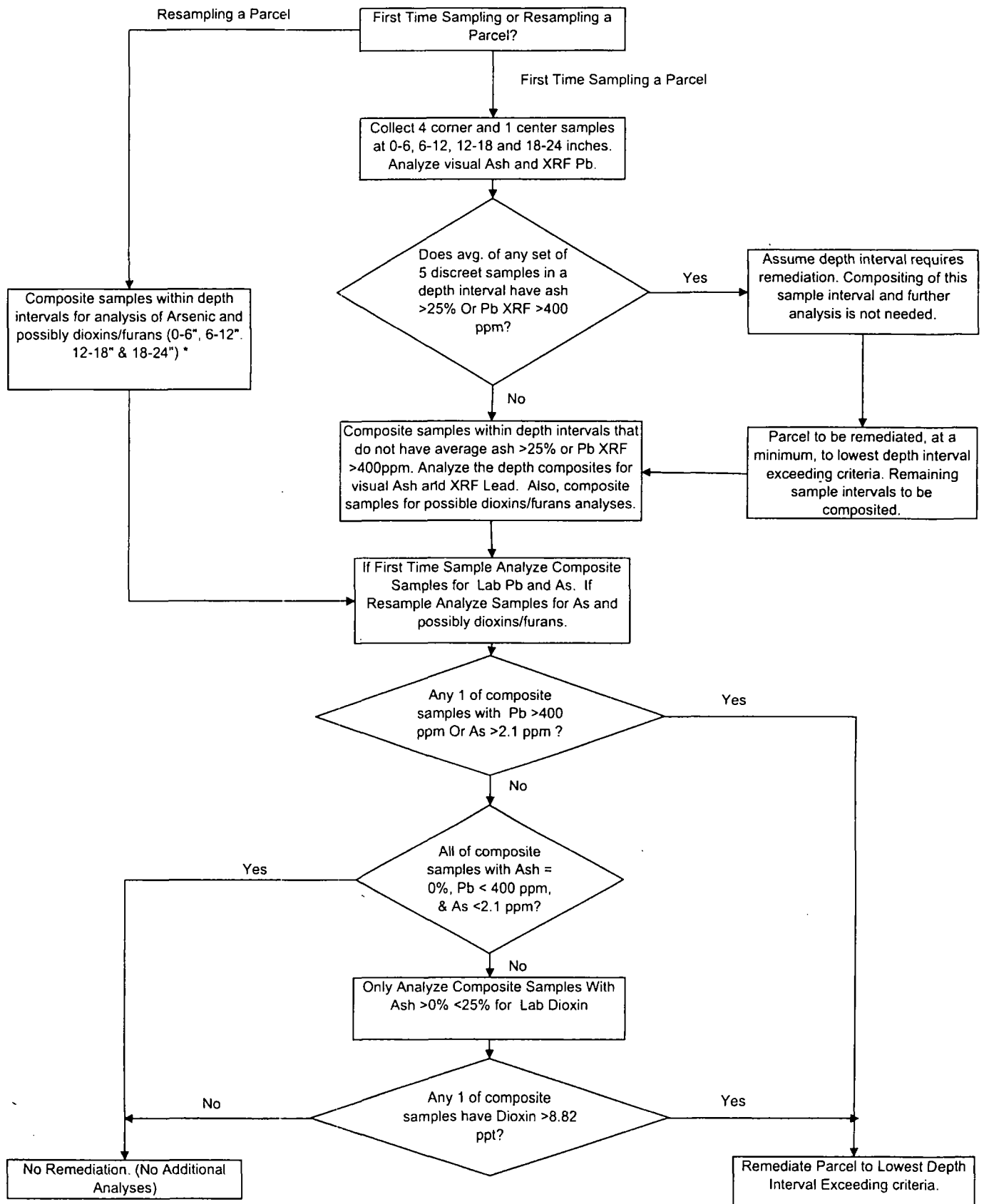
\*These parcels have been chosen based on whether they were surrounded by parcels already identified as "To Be Evaluated for Remediation"

3 4 0293

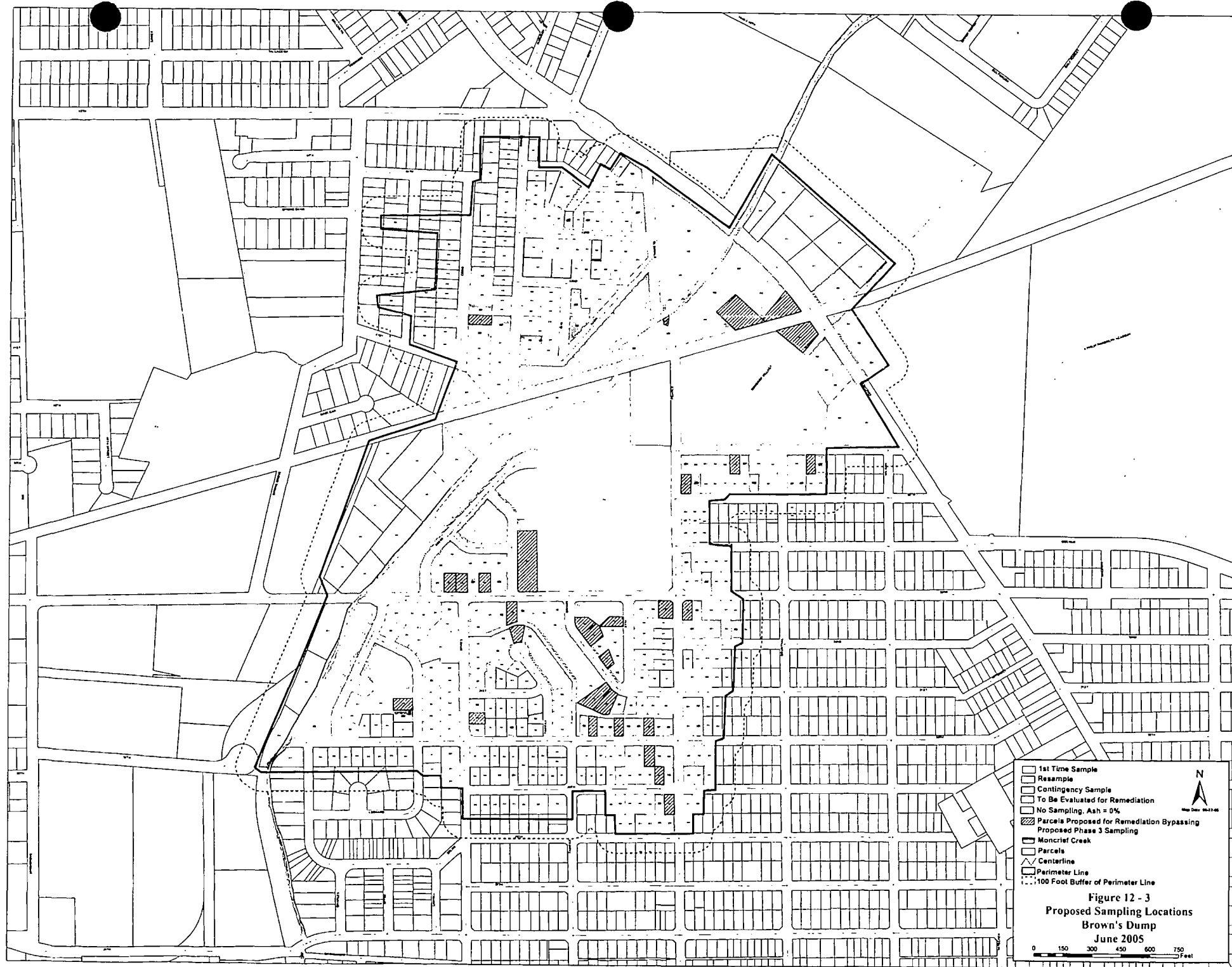
**Figures**

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Figure 10-1: Brown's Dump Phase 3 RI Sampling and Remediation Decision Flow Chart



Note: The sampling rational details are presented in Table 12-4



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**Appendix D**  
**Standard Operation Procedures**  
**for Field Sampling**

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## APPENDIX D

# Phase 3 Addendum (June 2005)

## Standard Operation Procedures for Field Sampling

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The standard operating procedures presented below are specific for the Phase 3 Remedial Investigation (RI). General procedures that were developed using ECBSOPQAM, 1996 and presented in the Work Plan, Revision No. 1 (February 2000) will be followed.

### 1.1 Introduction

The purpose of this document is to describe the sampling and data gathering strategy and procedures for conducting fieldwork activities, soil sample collection, sample control, and data input.

#### 1.1.1 Project Team

Title	Name	Description of Responsibilities
Project Manager (PM)	CH2M HILL	<ul style="list-style-type: none"> <li>• Responsible for overall coordination and execution of all work items associated with project planning and implementation</li> <li>• Provides liaison between program level managers and project level team members</li> <li>• Identifies team members and project assignments</li> <li>• Manages/tracks schedule and budget</li> <li>• Ensures project team meets scope, schedule, and budget</li> </ul>
Task Manager (TM)	CH2M HILL	<ul style="list-style-type: none"> <li>• Responsible for overall coordination and execution of all work items associated with project planning and implementation</li> <li>• Provides liaison between program level managers and project level team members</li> <li>• Identifies team members and project assignments</li> <li>• Manages/tracks schedule and budget</li> <li>• Ensures project team meets scope, schedule, and budget</li> </ul>

Title	Name	Description of Responsibilities
Field Team Leader (FTL)	CH2M HILL	<ul style="list-style-type: none"> <li>Responsible for coordination and execution of field tasks during implementation</li> <li>Responsible for implementing project quality assurance/quality control (QA/QC) measures at the site and for performing field activities in accordance with approved work plans</li> <li>Oversees sample collection team(s)</li> <li>Serves as decision-maker when actual field conditions deviate from those anticipated</li> <li>Tracks progress of field sampling team</li> <li>Liaison between field teams and project management</li> </ul>
Sample Custodian/Coordinator (SC)	CH2M HILL	<ul style="list-style-type: none"> <li>Responsible for correctly loading sample collection data into program database and creating working database</li> <li>Responsible for delivery of field samples to analytical laboratories via courier</li> <li>Communicates with analytical laboratories to notify of shipments to be received or samples to be pick-up onsite</li> <li>Keeps copies of logbooks, sample tracking forms, contaminants of concern (COCs), and other field data forms</li> <li>Adds field data to database and generates chain-of-custody (COC) forms</li> </ul>
Subcontractor Project Manager (SPM)	Aerostar	<ul style="list-style-type: none"> <li>Responsible for Aerostar field personnel performance</li> </ul>
Field Technicians (FT)	Aerostar	<ul style="list-style-type: none"> <li>Responsible for complying fully with the project instructions</li> <li>Responsible for keeping accurate and legible field notes</li> <li>Communicates with FTL</li> </ul>
Project Chemist (PC)	CH2M HILL	<ul style="list-style-type: none"> <li>Responsible for communications between subcontracted labs, PM, and project team, which includes (1) any discrepancies with analytical methods and/or results and (2) coordination of sampling containers</li> <li>Communicates regularly with the project team and analytical laboratories during the field activities</li> <li>Coordinates data validation details with the PM and labs</li> <li>Approves invoices from the subcontracted laboratories</li> <li>Communication with LPM of quality and contract related</li> </ul>
Project Data Manager (PDM)	CH2M HILL	<ul style="list-style-type: none"> <li>Responsible for creating database</li> <li>Updates or amends database as needed</li> <li>Creates queries</li> <li>Communicates with PC, PM, FTL, and SC</li> </ul>
Sample Courier	Severn Trent	<ul style="list-style-type: none"> <li>Responsible for daily pickup and delivery of samples</li> <li>Responsible for supplying coolers</li> <li>Responsible for supplying sample bottles and jars</li> <li>Communicates and coordinates with SC, LPMs, and FTL</li> </ul>



Title	Name	Description of Responsibilities
Laboratory Project Manager (LPM)	STL Tallahassee	<ul style="list-style-type: none"> <li>Responsible for communications between the PC, FTL, and internal laboratory project team</li> </ul>
	Paradigm Labs	<ul style="list-style-type: none"> <li>Receipt of sample custody from field team members, verification of sample integrity, and notification to PC of sample receipt</li> <li>Coordinates with internal laboratory team on all activities related to analysis and reporting of the laboratory results</li> <li>Communication with the PC regarding any quality and contract related issues</li> </ul>

### 1.1.2 Sampling Objectives and Scope of Work

The sampling objective is to collect data of sufficient quality and quantity to complete the RI by determining the identification of parcels to be considered for remediation. The flow chart (Figure 1) shows the field sampling analysis decision to meet this objective.

The following tasks will be completed in order to accomplish this objective:

- Extract and sample soil borings using sampling techniques that will include characterization of ash both qualitatively (visual observation) and quantitatively (XRF screening for lead).
- Fixed-base laboratory analysis of lead, arsenic, and dioxins for non-detect x-ray fluorescence (XRF) lead and visual ash.

### 1.1.3 Field Work Methods and Procedures

#### 1.1.3.1 Sampling a Parcel

- The parcels will be sampled as shown on the table to be provided at the beginning of the project. In addition, parcels that are to be sampled for the first time and parcels to be resampled are identified on this table. Field and laboratory analysis to be performed, based on whether a parcel is being sampled for the first time or resampled is also listed on this table. The following are the procedures for All Parcels, First Time Sampling a Parcel, Resampling a Parcel, and Quality Control (QC) Samples.

#### 1.1.3.2 All Parcels

- Five soil borings will be advanced (one central and four corners) for each parcel to 2 feet below land surface (bls). Four samples, at intervals of 0 to 6 inches, 6 to 12 inches, 12 to 18 inches, and 18 to 24 inches are to be collected from each soil boring.
- The soil samples will be placed in zip-lock baggies and labeled with the borehole letter and depth. The four corners will be: N, S, E, and W and the center will be C. The depths will be 0.0 feet (0- to 6-inch), 0.5 feet (6- to 12-inch), 1.0 feet (12- to 18- inch), and 1.5 feet (18- to 24-inch).
- The 20 soil samples will be recorded on the Sample Tracking Form and labeled as follows: P3BDNNNP D.D where P3 is Phase 3, BD is code for the site (Brown's Dump),

NNN is the parcel ID (059, 334, etc.), P is the position on the property (N, S, E, W, or C), and D.D is the depth (0.0, 0.5, 1.0, or 1.5). Example: P3BD087S1.5.

#### 1.1.3.3 First Time Sampling of a Parcel

Parcels that have not been sampled during the performance of the Phase 1 and Phase 2 activities and are located adjacent to a parcel that have reported exceedances of ash and/or lead will be evaluated during the Phase 3 activities (pending receipt of access agreements from the property owner before completion of the Phase 3 activities). These parcels are referred to as First-Time Sampling. A sampling and remediation decision flow chart is presented in **Figure 10-1**. The following provides additional detail on the field procedures to be followed during the performance of Phase 3 for First-Time Sampling of a Parcel.

- Five soil borings will be advanced (one central and four corners) for each parcel to 2 feet bls. Individual soil samples from each boring will be collected at the 0- to 6-inch, 6- to 12-inch, 12- to 18-inch, and 18- to 24-inch intervals.
- Each of the soil samples (total of 20 per parcel) will be checked visually for ash and field screened for lead using XRF.
- The average percent-ash and -XRF lead will be calculated for each sample depth interval. If the average value exceeds 25 percent ash or XRF lead of 400 parts per million (ppm), the sample interval will be considered to exceed criteria and further compositing and analysis of samples from the interval will not be performed. If an upper depth interval exceeds criteria but lower intervals do not exceed criteria, the lower intervals will be composited and further analysis performed as described below. If a deeper interval exceeds criteria but the upper interval(s) do not, further compositing and analysis of samples from the upper interval(s) will not be performed. The intent of comparing the average of the discrete samples to the criteria is to eliminate unnecessary analytical costs of composite samples.
- The individual samples will be composited by sample depth interval (except those intervals as described above). For each depth interval five samples will be composited, resulting in four composite samples. The composite sample will be checked visually for ash content and analyzed for XRF lead. If the results are less than 25 percent for ash or 400 ppm for XRF lead, the composite sample will be submitted to the laboratory for analyses of lead and arsenic.
- Where one or more composite laboratory samples have lead greater than 400 ppm or arsenic greater than 2.1 ppm; the parcel will be remediated. If a composite laboratory sample reported lead less than 400 ppm and arsenic less than 2.1 ppm, the sample will be analyzed if the field screening indicated ash is greater than 0 percent and less than 25 percent dioxin analysis will be performed. If the field screening indicated ash is 0 percent then no dioxin analysis will be performed. The parcel will be remediated only to the depth interval exceeding the criteria. In these cases the lower depth interval would require analysis to verify residual constituents are within criteria.

#### 1.1.3.4 Resampling a Parcel

Some of the parcels that were sampled during the performance of the Phase 1 and Phase 2 activities and did not exhibit exceedances of the parameters analyzed will be resampled and analyzed for parameters not performed previously. The parcels to be resampled are those

located adjacent to a parcel that exhibits exceedances of ash and/or lead. These parcels are referred to as Resample. The procedures are identical to those described above with the exception that the laboratory analyses to be performed on composite samples will be based on the past analyses for the parcel (e.g., if lead was previously analyzed it will not be re-analyzed. Also the discrete samples will not need to be re-analyzed for visible ash and XRF lead because this was previously performed at these parcels.

#### **1.1.4 Laboratory Analysis Strategy for Soil and Ash**

The standardized laboratory analysis strategy for parcel-by-parcel sampling is as described above. Additional detail is described below:

- Lead and arsenic will be analyzed using the Environmental Protection Agency (EPA) Method 6010. Dioxins and furans will be analyzed using EPA Method 8290.

##### **1.1.4.1 QC Samples**

- For every 10 composite samples, a field duplicate sample (FD) will be collected and labeled P3BDNNN-0.5FD. Example: P3BD087-2.0FD. Each sample will consist of four jars, two original samples and two FD.
- For every 20 composite samples, a matrix spike and matrix spike duplicate (MS/MSD) will be collected and labeled P3BDNNX0.5MS/MSD. Example: P3BD087X2.0MS/MSD. Each sample will consist of six jars, two original samples, and four MS/MSD. If the MS/MSD coincides with the FD, there will be eight jars per sample.
- Each sample jar will receive a chain of custody (COC) seal signed by the sampler, placed in a zip-lock bag, and put into a cooler with ice.
- Any excess soil will be placed back into the hole it came from. Used gloves and visqueen will be placed in a garbage bag. Leave nothing at the site.

**Appendix F**  
**Quality Assurance Project Plan**

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## APPENDIX F

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## SECTION 1

# Project Management

---

This document presents the Quality Assurance Project Plan (QAPP) for the Remedial Investigation/Feasibility Study (RI/FS) of the City of Jacksonville, Florida Ash Sites, which include the following individual sites:

- Brown's Dump Site - Brown's (BD)
- Forest Street Incinerator Site - Forest Street (FS)
- 5<sup>th</sup> & Cleveland Incinerator Site - 5<sup>th</sup> & Cleveland (5C)
- Lonnie C. Miller, Sr. Park Site - Miller Park (MP)

The four sites have been grouped according to two Consent Orders (COs): Brown's Dump Site, and the Jacksonville Ash Site. The latter site includes the Forest Street Incinerator Site, the 5<sup>th</sup> & Cleveland Incinerator Site, and the Lonnie C. Miller, Sr. Park Site. A QAPP is required for this project because samples will be collected for laboratory analysis to acquire data for site characterization and baseline risk assessment, and to meet the requirements of the COs.

## 1.1 Introduction

This QAPP has been prepared to provide quality assurance/quality control (QA/QC) requirements for sampling activities, sample analyses, and other tests that will generate data as part of the activities performed for the RI/FS. The RI/FS process is the means by which the nature and extent of risks posed by a hazardous waste site are quantified, and potential remedial options are evaluated, sufficient to support an informed risk management decision regarding remedial action. This QAPP is prepared as a component of the Work Plan (WP) and has been prepared in accordance with the U.S. Environmental Protection Agency's (EPA) *Guidance for Quality Assurance Project Plans* EPA QA/G-5 (U.S. EPA, December 2002).

QA involves all those planned and systematic actions necessary to provide adequate confidence that field activities will be performed satisfactorily and safely. The goal of QA is to ensure that activities are planned and performed according to accepted standards and practices to ensure that the resulting data are valid and useable for the project decision-making process, while continuing to meet safety requirements. QC is an integral part of the overall QA function and is comprised of all those actions necessary to control and verify that project activities and the resulting data meet established requirements.

The requirements of this document apply to CH2M HILL and its subcontractors. Deviations from these procedures will be documented in the final report.

This section provides an overview of project management and addresses the following topics:

- Project organization and roles and responsibilities
- Project definition and background

- Project description
- Quality objectives and criteria for measurement data
- Special training requirements or certificates required for work performed in support of the CO
- Documentation and records management

Section 2 of this QAPP describes the measurement and data acquisition procedures, and analytical methods to be performed in support of this investigation. It addresses the following aspects of measurement and data acquisition:

- Sampling process design
- Sampling method requirements
- Sample handling and custody requirements
- Analytical method requirements
- QC requirements
- Instrument and equipment testing, inspection, and maintenance requirements
- Instrument calibration and frequency
- Inspection and acceptance requirements for supplies and consumables
- Data acquisition requirements

Section 3 describes the assessment and oversight activities that will be followed to determine whether the QC identified in the Field Sampling Plan (FSP) and this QAPP are being implemented and documented as required.

Section 4 presents the data review, validation, and evaluation requirements.

## 1.2 Project Organization Roles and Responsibilities

This subsection identifies key project team members associated with the planned sampling work and lists the responsibilities associated with each position. The organizational structure and responsibilities are designed to provide project control and quality assurance for the proposed investigation. The project team and their roles are shown on Figure 9-1 of this WP.

**EPA Region 4 Remedial Project Manager (RPM): Brown's Dump Site – Wes Hardegree, Jacksonville Ash Site: Joe Alfano.** The RPM will serve as the primary point of contact for the EPA, and will provide guidance and direction to the contractor throughout the project.

**Project Manager (PM): Tony Wagner.** The PM is responsible for overall activities for a specific project. The PM is responsible for cost and schedule control and for technical quality; in addition, he develops the work plan and monitors task order activities to ensure compliance with project objectives and scope. The PM also communicates with the US EPA and City of Jacksonville and, as appropriate, other designated parties regarding project progress.

The PM has ultimate responsibility within the project team for producing deliverables that are technically adequate, satisfactory to the client, and cost-effective. To accomplish this, the

PM develops an internal project review schedule, provides written instructions and frequent guidance to the project team, and monitors budgets and schedules. The PM works with the project team to select an internal QA/QC review team and to coordinate review efforts, and works with the project team in addressing review comments and adjudicating technical disagreements.

**Senior Consultant and Review Team Leader (RTL): Paul Favara.** The RTL is a company-wide resource with significant experience in the various technical aspects involved in a complex project. The RTL coordinates all internal QA/QC review for technical validity and adherence to both internal CH2M HILL policy and EPA criteria. The review team is responsible for evaluating the technical merit of the work planning documents before field activities begin, and reviewing all deliverables before submittal to EPA. The RTL assists the PM in selecting an internal QA/QC review team, coordinating review efforts, and works with the project team in addressing review comments and resolving technical issues.

**Assistant Project Manager (APM): Tracy Langille.** The Assistant Project Manager assists the PM in the project management role, serving as a contact to team members in the PM's absence and assisting with PM-related duties, and guiding task leaders within the project objectives.

**Project Risk Assessor: Vijaya Mylavarapu.** The lead risk assessor provides guidance and input into the project planning stages, and directs the risk assessments for the project.

**Project Chemist (PC): Herb Kelly.** The PC assists with the preparation of the project work planning documents, provides a point of communication between the laboratory and the project team, supervises the analytical data quality evaluation, and participates in preparing deliverables to the client. The PC coordinates with the project team and the analytical laboratory during the field activities. The PC also is responsible for monitoring project-specific laboratory activities (including checking laboratory invoices and reports) and may audit the laboratory operations at the PM's direction. The PC also monitors field and laboratory activities such that QA/QC requirements described in this project-specific QAPP are coordinated effectively.

**Project Database Manager (PDM): Rick Dobbins.** The PDM is responsible for the structure, organization, format, implementation, and operation of the project database. The PDM also works with the database on a daily basis and provides normal deliverables (for example, data summary tables) to the project team.

**Field Team Leader (FTL): Kristina Lambert.** The FTL reports to the PM and is responsible for the coordination of field efforts, provides for the availability and maintenance of sampling equipment and materials, and provides shipping and packing materials. The FTL will supervise completion of all COC records, supervise the proper handling and shipping of samples, and be responsible for accurate completion of the field notebooks. As the lead field representative, the FTL will be responsible for consistently implementing program QA/QC measures at the site and for performing field activities in accordance with approved work plans, policies, and field procedures.

**Site Safety Coordinator (SSC): Kristina Lambert.** The SSC develops and implements the project Health and Safety Plan (HSP) in the field. The SSC will assist in conducting site briefings and perform all final safety checks. The SSC is responsible for stopping any



investigation-related operation that threatens the health and safety of the field team or surrounding populace.

**Health and Safety Manager (HSM): Michael Goldman.** The HSM reviews and approves the project-specific HSP as well as subcontractor HSPs. The HSM serves as the point of contact for the SSC for any health and safety-related issues, and may conduct project audits. The HSM is also responsible for investigating accidents should any occur during the course of the project.

### 1.2.1 Laboratory Work Group

The selected laboratory is responsible for analyzing samples collected during field activities, in accordance with the FSP and the laboratory's quality assurance plan. The laboratory PM or client service manager acts as a liaison between field and laboratory operations and is responsible for the following:

- Receipt of sample custody from the field team members, verification of sample integrity, and transfer of sample fractions to the appropriate analytical departments.
- Coordination of sample analyses to meet project objectives.
- Preparation of analytical reports.
- Review of laboratory data for compliance with method requirements
- Review of any QC deficiencies reported by the analytical department manager.
- Coordination of any data changes resulting from review by the project QA supervisor or the PM.
- Completion of data package deliverables.
- Response to questions from the project team during the data quality evaluation process.

### 1.2.2 Project Communication

Effective communication among all project personnel shall be established and maintained throughout the course of the project. At the beginning of the project, and/or at the start or end of major milestones, the PM will prepare written project instructions that will be distributed to all team members. These instructions will document project and task objectives, and each team member's responsibility in meeting the objectives, as well as a budget and schedule for successfully executing the work.

Before field activity begins, a project team meeting will be held to review the project objectives. Periodic meetings will be held to review data validity, technical evaluations, major decisions, and overall progress toward completing the project. Additionally, a team kickoff meeting will be held before work on each task is started. Senior personnel, including the review team leader, may participate in the meetings to help focus the project approach and to define specific issues.

During the field investigation phase of this project, the field team will meet daily to review the status of the project and to discuss technical and safety issues. When necessary, other

meetings will be scheduled or the FTL will meet individually with field personnel, EPA personnel, or State personnel to resolve problems. Following the field effort, the FTL will prepare a trip report detailing project progress.

During the field effort, the FTL will be in regular telephone or face-to-face contact with the project team. When significant problems or decisions requiring additional authority occur, the FTL will immediately contact the PM for assistance. The PC will coordinate communication with the laboratory through sample collection, sample analysis, and data quality evaluation and consult with the PM.

### **1.3 Problem Definition and Background**

The four ash sites typically include disposed ash from incineration of municipal solid waste. The background and history of each site is presented in Section 1 of the Work Plan.

### **1.4 Project Description**

The overall objectives of the RI/FS sampling effort include the following:

- Determine the nature and extent of contamination at the Site
- Assess the current and potential risk to human health and the ecology posed by site contaminants
- Collect sufficient data to identify and evaluate potential remedial action alternatives.

These project objectives were used to develop specific Data Quality Objectives (DQOs) described in the next subsection.

### **1.5 Quality Objectives and Criteria for Measurement Data**

This subsection defines the levels of data that will be generated as part of the RI/FS and briefly outlines the DQO development process for this investigation. The level of data quality is dependent on the objective use of the results supported by the data. This subsection also provides the quantitative quality objectives and measurement performance criteria for the analytical data.

#### **1.5.1 Levels of Data Quality**

Three categories of data will be collected as part of this field effort, and each category has a different level of supporting QA/QC documentation. Level 1 includes field monitoring activities, such as pH, conductivity, temperature, oxidation-reduction potential and dissolved oxygen. Level 2 includes the analyses for the physical parameters such as grain size, atterberg limits, specific gravity, percent moisture, and the analyses associated with the characterization of the IDW samples. All other analyses will be submitted to the laboratory for Level 3 analyses. For each QC level, the measures and methods to be used, as well as the applicable data package deliverables, are outlined below.

### 1.5.2 Level 1–Field Surveys

Level 1 encompasses field monitoring or screening activities and does not require formal data package deliverables. Level 1 activities are focused on easily measured bulk characteristics of a sample such as pH, conductivity, oxidation-reduction potential and dissolved oxygen. Monitoring results, as well as pertinent data concerning the sampling event, will be documented in the bound field book. Level 1 documentation will consist of the following:

- Instrument identification
- Calibration information (standards used and results)
- Date and time of calibration and field measurements
- Field measurement results

The logbooks will be reviewed daily by the FTL for completeness and correctness. No additional documentation or data quality evaluation is required.

### 1.5.3 Level 2–Physical Parameters and IDW analyses

Level 2 includes the analyses submitted to the laboratories for physical parameter testing and analyses associated with the characterization of the IDW samples. Samples submitted for analysis under Level 2 will required the delivery of an analytical data package. Level 2 documentation will consist of the following:

- Case Narrative
- Sample results
- Selected QC information such as surrogate recovery
- Associated blank results
- Completed COC and any sample receipt information

### 1.5.4 Level 3–Laboratory Analysis

The list of methods (presented in Section 2.4) and the corresponding target analytes have been designed to evaluate the potential for contamination at the site. Requirements for Level 3 documentation are also described in Section 2.4. Samples will be analyzed using EPA approved methods, including methods from the following documents:

- SW-846 - *Test Methods for Evaluating Solid Waste* (USEPA, 1996).
- Annual Book of ASTM (American Society for Testing and Materials) Standards.
- U.S. Environmental Protection Agency, 1983. *Methods for Chemical Analysis of Water and Wastes*.

### 1.5.5 Data Quality Objective Development

DQOs are both qualitative and quantitative statements that define the type, quality, and quantity of data necessary to support defensible risk management decisions. The DQO process used for this project follows the EPA QA/G-4 guidance (U.S. EPA, 1996a) and uses the seven-step DQO development process below. A detailed discussion of the development of the project-specific DQOs is presented in each of the specific FSP sections of the Work Plan.

1. **State the problem.** Describe concisely the problem to be studied.
2. **Identify the decisions.** State the decisions to be made to solve the problem.

3. **Identify inputs to the decisions.** Identify information and supporting measurements needed to make the decisions, and describe the source(s) of the information.
4. **Define the study boundaries.** Specify conditions (that is, time periods and spatial locations).
5. **Develop a decision rule.** Define the conditions by which a decision-maker will select alternatives, usually specified as "if/then" statements (for example, if average concentration in soil is less than cleanup level, then the site achieves remedial action goals).
6. **Specify acceptable limits on decision errors.** Define in statistical terms.
7. **Optimize the design.** Evaluate the results of the previous steps and develop the most resource-efficient design for data collection.

### 1.5.6 Method Performance Objectives

The sampling approach and rationale is based on the DQOs. The sampling approach and rationale were developed and are presented in the Work Plan. One activity associated with developing the sampling approach and rationale is developing a list of samples to be collected, sample types, sampling intervals, analytical parameters, and required detection/quantification limits for each required parameter.

Once the number and type of samples and analytical parameters are determined, the method performance requirements are developed. The method performance requirements focus on determining the level of QA/QC and the data package deliverable requirements for all analyses.

### 1.5.7 Quality of Data

Analytical performance requirements are expressed in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC). Summarized below are brief definitions for each PARCC parameter, and calculation equations as appropriate. The project's screening data goals and laboratory goals with respect to PARCC will be contained in the FSP.

#### 1.5.8 Precision

Precision is a measure of the agreement or repeatability of a set of replicate results obtained from duplicate analyses made under identical conditions. Precision is estimated from analytical data and cannot be measured directly. The precision of a duplicate determination can be expressed as the relative percent difference (RPD), calculated as:

$$RPD = \left\{ \frac{|X_1 - X_2|}{\frac{(X_1 + X_2)}{2}} \right\} \times 100$$

where  $X_1$  is the result from the native sample, and  $X_2$  is the result from the duplicate sample.

### 1.5.9 Accuracy

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Accuracy is estimated through the use of known reference materials or matrix spikes. It is calculated from analytical data and is not measured directly. Spiking of reference materials into a sample matrix is the preferred technique because it provides a measure of the matrix effects on analytical accuracy.

Accuracy, defined as percent recovery (P), is calculated as:

$$P = \left[ \frac{(SSR - SR)}{SA} \right] \times 100$$

where SSR is the spiked sample result, SR is the sample result (native), and SA is the spike concentration added to the spiked sample.

### 1.5.10 Representativeness

Representativeness is a measure of the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Representativeness is demonstrated by providing full descriptions in the project planning documents of the sampling techniques and by making certain that the sampling locations are selected and the number of samples collected such that the accuracy and precision criteria are met.

### 1.5.11 Comparability

Comparability is another qualitative measure designed to express the confidence with which one data set may be compared to another. Sample collection and handling techniques, sample matrix type, and analytical method all affect comparability. Comparability is limited by the other PARCCS parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from one phase of an investigation can be compared to others when similar methods are used and similar data packages are obtained.

### 1.5.12 Completeness

Completeness is defined as the percentage of measurements judged to be valid, compared to the total number of measurements made for a specific sample matrix and analysis.

Completeness is calculated using the formula:

$$\text{Completeness} = \frac{\text{Valid Measurements}}{\text{Total Measurements}} \times 100$$

Experience on similar projects has shown that laboratories typically achieve approximately 90 percent completeness. All validated data will be used. During the data validation process, an assessment will be made of whether the valid data are sufficient to meet project objectives. If sufficient valid data are not obtained, the PM will initiate corrective action.

## 1.6 Special Training, Requirements, and Certifications

The PM works with the project delivery manager to assemble a project team that has the necessary experience and technical skills. Part of the work planning process is to identify special training requirements or certifications necessary to execute the project successfully. Special training or certifications required beyond the normal routine requirements have not been identified for this project.

## 1.7 Documentation and Records

This section defines which records are critical to the project and what information needs to be included in reports, as well as the data reporting format and the document control procedures to be used. It is imperative for the defensibility of critical decisions made at the site that proper documents and records be maintained for the field and offsite data gathering activities, so that specific events can be recreated or independently evaluated. The PM will be responsible for organizing, storing, and cataloging all project information. The PM is also responsible for collecting records and support data from all project team members. Individual project team members may maintain separate notebooks for individual tasks; any files necessary to be retained in the permanent file will be forwarded to the PM for real-time archiving upon preparation. Permanent files will not be retained in individual team members possession and forwarded to the PM at the close of the project, although copies of permanent records may be retained in their individual files for use during the project and discarded at the close of the project. Personal copies of permanent records will not be forwarded to the PM at the close of the project; it is the individual's responsibility to ensure records in their possession are archived real-time.

### 1.7.1 Surveying

Details of the surveying activities are provided in the FSP. The elevation (vertical) and horizontal control surveys will be extended to sample locations, including groundwater wells. Levels of accuracy of +0.1 foot for vertical control and +1 foot for horizontal control are expected. Elevation data will be recorded with reference to a described benchmark.

### 1.7.2 Field Documentation

Primary fieldwork includes geotechnical investigation as well as sampling for chemical characterization. Applicable documents and records include the following (copies of forms are provided in the FSP):

- Soil boring logs.
- Monitor well construction diagrams.
- Well development logs.
- Water level data sheets.
- Photographic documentation for intrusive, as well as non-intrusive, work.

- Field logbook to record data collection activities and observations (including date and time, sample locations, depth, health and safety measures, weather conditions, sampling personnel, analyses requested, and sketches).
- Sample collection field sheets or COC documentation.
- Field instrument calibration and maintenance logs.
- Additionally, field quality control and corrective action documents may be generated as a result of field audits.

### **1.7.3 Laboratory Documentation**

The laboratory data package deliverables are discussed in Section 2.4.

The electronic deliverable will be provided by the laboratory as specified in the data management section of the work plan.

## SECTION 2

## Measurement and Data Acquisition

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This section describes the procedures for collection, handling, measurement, data acquisition, and management activities to be performed in support of the RI/FS. It addresses the following aspects of measurement and data acquisition:

- Sampling process design
- Sampling method requirements
- Sample handling and custody requirements
- Analytical methods requirements
- QC requirements
- Instrument and equipment testing, inspection, and maintenance requirements
- Instrument calibration and frequency
- Inspection and acceptance requirements for supplies and consumables
- Data acquisition requirements

### 2.1 Sampling Process Design

The FSP will provide the sampling and analysis requirements and the design of the data collection process for the RI/FS. Included are the types and numbers of samples required, the design of the sampling network, the sampling locations, matrices, frequencies, and the rationale for the design.

### 2.2 Sampling Method Requirements

Sampling methods are described in the RI/FS WP. This section includes instructions for the following procedures:

- Field parameter measurement
- Soil sample collection
- Groundwater sample collection
- QC sample collection
- Preservation of samples

The analytical methods, sample containers, preservative requirements, and maximum holding times for common methods are specified in Table 2-1.

### 2.3 Sample Handling and Custody Requirements

Proper sample handling, shipment, and maintenance of a COC are key components to building the documentation and support for data that can be used for decision-making. It is essential that all sample handling and sample COC requirements be performed in a complete, accurate, and consistent manner. Sample handling and custody requirements, as



described in the DMP, must be followed for all samples collected as part of the investigation.

The FTL is responsible for proper sampling, labeling, preservation, and shipment of samples to the laboratory to meet required holding times.

### 2.3.1 Sample Custody

Sample custody and documentation procedures described in this section will be followed throughout all sample collection activities. Components of sample custody procedures include the use of field logbooks, sample labels, custody seals, and COC forms. Each person involved with sample handling must be trained in COC procedures before the start of the field project. The COC form must accompany the samples during shipment from the field to the laboratory.

A sample is under custody under the following conditions:

- It is in one's actual possession
- It is in one's view, after being in one's physical possession
- It was in one's physical possession and that person locks it up to prevent tampering
- It is in a designated and identified secure area

### 2.3.2 Field Custody

The following procedures must be used to document, establish, and maintain custody of field samples:

- Sample labels must be completed for each sample with waterproof ink, ensuring that the labels are legible and affixed firmly on the sample container.
- All sample-related information must be recorded in the project logbook.
- The field sampler must retain custody of samples until they are transferred or properly dispatched.
- One individual from the field sampling team should be designated the individual responsible for all sample transfer activities. This field investigator will be responsible for the care and custody of samples until they are properly transferred to another person or facility.
- All samples will be accompanied by a COC record. This record documents the transfer of custody of samples from the field investigator to another person, to the laboratory, or to other organizational entities. Each change of possession must be accompanied by an authorized signature for relinquishment and receipt of the samples.
- Completed COC forms will be enclosed in a plastic cover and placed inside the shipping container used for sample transport from the field to the laboratory.
- When samples are relinquished to a shipping company for transport, the tracking number from the shipping bill or receipt will be recorded on the COC form.

- Custody seals must be affixed on shipping containers when samples are shipped to the laboratory to prevent sample tampering during transportation.

### 2.3.3 Laboratory Sample Custody

Each laboratory receiving samples must comply with the laboratory sample custody requirements outlined in the subcontract document and its own quality assurance plan. The FTL or PC will notify the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped, and the expected date of arrival.

The following procedures will be used by the laboratory sample custodian, once the samples have arrived at the laboratory:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check the original COC and request-for-analysis documents and compare them with the labeled contents of each sample container for corrections and traceability. The sample custodian will sign the COC and record the date and time received. The sample custodian also will assign a unique laboratory sample number to each sample.
- Cooler temperature (temperature vial) will be checked and recorded.
- Care will be exercised to annotate any labeling or descriptive errors. If discrepancies occur in the documentation, the laboratory will immediately contact the FTL as part of the corrective action process. A qualitative assessment of each sample container will be performed to note anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming COC procedure.
- If all data and samples are correct and there has been no tampering with the custody seals, the "Received by Laboratory" box will be signed and dated.
- Samples will be stored in a secured area and at a temperature of approximately 4 degrees Centigrade (°C), if necessary, until analyses are to begin.
- The laboratory will send a sample acknowledgment letter to the PC as a record that the shipment arrived and the conditions of the containers upon arrival. Any discrepancy will be identified and corrective actions performed. The PC may need to provide guidance concerning additional actions. A copy of the sample acknowledgment will be retained with the COC by the project manager.
- All samples will be accompanied by a COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the field sampler to another person, or to the laboratory. Overnight carriers will be treated as a single entity, and a single signature will be required when samples are delivered to the laboratory.

- A laboratory COC form will accompany the sample or sample fraction through final analysis for control.
- Copies of the COC and request-for-analysis forms will accompany the laboratory report and will become a permanent part of the project records.
- Samples must be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed COC form enclosed in each sample box or cooler.
- All packages must be accompanied by a COC form identifying the contents. The original record must accompany the shipment, and the FTL must retain a copy. Additional details about laboratory sample custody will be included in the laboratory comprehensive quality assurance plan (CompQAP).

### 2.3.4 Sample Packing and Shipping

Samples will be delivered to the designated laboratories by local courier or by a common carrier such as Federal Express. Hard plastic ice chests or coolers with similar durability will be used for shipping samples. The coolers must be able to withstand a 4-foot drop onto solid concrete in the position most likely to cause damage. The samples must be cushioned to cause the least amount of damage if such a fall occurs.

All aqueous volatile organic compound (VOC) sample vials will be shipped in the same cooler on a given day. A trip blank will be included in each cooler with VOC samples. After collection of soil samples, the Encore or equivalent sample containers are placed in a resealable packet supplied by the vendor, and included in the sample coolers. (In those cases where soil samples may contain high levels of target compounds, it is advisable to ship the aqueous and soil samples in separate coolers). After packing is complete, the cooler will be taped with COC seals affixed across the top and bottom joints. Each container will be clearly marked with a sticker containing the originator's address.

The following procedures must be used when transferring samples for shipment:

- All sample coolers/packages must be accompanied by a COC form identifying the contents. When transferring possession of samples, the individuals relinquishing and receiving the sample must sign, date, and note the time on the record. This record documents transfer of custody of samples from the field sampler to another person or to the laboratory. The original COC record must accompany the shipment, and the FTL must retain a copy.
- Samples must be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed COC form enclosed in each sample box or cooler.

## 2.4 Analytical Method Requirements

This subsection summarizes the target analytes, analytical methods, reporting limits, and data package deliverables that will be required for the Intertidal Area and SWMU Group investigation.

Samples will be analyzed using EPA-approved methods or other recognized standard methods (U.S. EPA, 1992). The three principal sources for analytical methods are:

1. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (U.S. EPA SW-846, Third Edition, and its first and second and third updates, 1997)
2. U.S. EPA, *Methods for Chemical Analysis of Water and Wastewater*
3. American Society for Testing and Materials (ASTM). *Main Ballot for Data Quality Objectives Document, D34.02.10*. ASTM, Philadelphia, PA. 1994

Table 2-1 presents the analytical methods to be used for the analysis of the target compounds.

## **2.4.1 Field Screening and Analysis Method Descriptions**

This section describes the various field-screening and field-analysis methods expected to be utilized during the RI/FS field investigation.

### **2.4.1.1 SW846/9040 (Water) — pH**

Water samples will be measured for pH using Method SW9040. Measurements are determined electrometrically using either a glass electrode in combination with a reference potential, or a combination electrode. The person taking the measurement shall follow the manufacturer's recommended instructions for instrument calibration, operation, and maintenance.

### **2.4.1.2 SW846/9050 (Water) — Conductance and Temperature**

Standard conductivity meters, which also measure water temperature, shall be used for this measurement. The person taking the measurement shall follow the manufacturer's recommended instructions for instrument calibration, operation, and maintenance.

### **2.4.1.3 EPA Method 170.1 (Water) — Temperature**

Temperature measurements are made with a mercury-filled or dial-type centigrade thermometer, or a thermistor.

### **2.4.1.4 EPA Method 360.1 (Water) — Dissolved Oxygen**

An instrumental probe, typically dependent upon an electrochemical reaction, is used for determination of dissolved oxygen in water. Under steady-state conditions, the current or potential can be correlated with dissolved oxygen concentrations. The person taking the measurement shall follow the manufacturer's recommended instructions for instrument calibration, operation, and maintenance.

### **2.4.1.5 ASTM D1498-93 (Water) — Oxidation-Reduction Potential**

This method is designed to measure the oxidation-reduction potential (ORP) in water, which is defined as the electromotive force between a noble metal electrode and a reference electrode when immersed in a solution.

**2.4.1.6 Hach Turbidimeter model - Turbidity**

This method uses a turbidimeter measure the turbidity of the water. An aliquot of the water is placed into a cell and the light that is scattered is proportional to the amount of turbidity in the sample.

**2.4.2 Analytical Methods for General Chemistry and Physical Parameters**

General chemistry and physical methods to be utilized include, but are not limited to sulfide, sulfate, nitrate-nitrite, total suspended solids and total dissolved solids, total organic carbon, and alkalinity. References for these methods are described below.

**2.4.2.1 EPA Method 160.1 (Water) — Total Dissolved Solids**

For measuring filterable residue, a well-mixed sample is filtered through a standard glass fiber filter. The filtrate is evaporated and dried to constant weight at 180°C.

**2.4.2.2 EPA Method 160.2 (Water) — Total Suspended Solids**

For measuring total residue, the water is evaporated and dried to a constant weight at 180°C.

**2.4.2.3 EPA Method 310.1 (Water) — Alkalinity**

For this method, an unaltered sample is titrated to an end point of pH 4.5 using hydrochloric or sulfuric acid.

**2.4.2.4 SW846/9045 (Soil) — pH**

Soil samples will be measured for pH using method 9045. Measurements are determined electrometrically using either a glass electrode in combination with a reference potential, or a combination electrode. The person taking the measurement shall follow the manufacturer's recommended instructions for instrument calibration, operation, and maintenance.

**2.4.2.5 ASTM D2216 (Soil) — Percent Moisture**

Percent moisture is determined for solid samples undergoing analysis for inorganic and organic parameters. The sample is weighed, dried, and then re-weighed. Percent moisture is calculated as:

$$\frac{\text{Initial Weight} - \text{Dried Weight}}{\text{Dried Weight}} \times 100 = \% \text{ Moisture}$$

Initial Weight

The moisture content is used to calculate results for soil samples on a dry weight basis using the calculation presented below:

$$\text{Result of analysis on wet weight basis} = \text{Result of analysis on dry weight basis}$$

$$1 - (\% \text{ Moisture} / 100)$$

All soil or sediment results and MDLs shall be reported on a dry weight basis.

**2.4.2.6 SW846/9060 (Water and Soil) — Total Organic Carbon**

Organic carbon is measured using a carbonaceous analyzer. This instrument converts the organic carbon in a sample to carbon dioxide by either catalytic combustion or wet chemical oxidation. The carbon dioxide formed is then either measured directly by an infrared detector or converted to methane and measured by a flame ionization detector. The amount of carbon dioxide or methane in a sample is directly proportional to the concentration of carbonaceous material in the sample. The RL for this method (for water) is 1 mg/L.

**2.4.2.7 EPA Method 375.4 (Water) — Sulfate**

This method addresses the determination of sulfate using a spectrophotometer.

**2.4.2.8 EPA Method 376.1 (Water) — Sulfide**

This method addresses the determination of sulfide in water samples using titrimetric measurements.

**2.4.2.9 EPA Method 353.2 (Water) — Nitrate-N**

This method determines the nitrite-nitrate combined in water samples. The nitrate-nitrite values are obtained by carrying out a copper-cadmium reduction and measured colorimetrically.

**2.4.2.10 EPA Method 350.1 (Water) — Ammonia-N**

This method addresses the determination of ammonia in water samples colorimetrically.

**2.4.2.11 SW846/6010 (Water) — Dissolved Iron**

This method addresses the determination of iron by Inductively coupled plasma-atomic emission spectrometry (ICP-AES). The sample is filtered in the field, prior to receipt at the laboratory.

**2.4.2.12 ASTM D422-63(1998) (Soils) — Particle Size Distribution**

This method covers the quantitative determination of the distribution of particle sizes in soils. The distribution of particle sizes larger than 75  $\mu\text{m}$  (retained on the No. 200 sieve) is determined by sieving, while the distribution of particle sizes smaller than 75  $\mu\text{m}$  is determined by a sedimentation process using a hydrometer.

**2.4.2.13 ASTM D4892-89(1994) — Bulk Density**

The procedures described in this method describe the standard test to determine the density of solids by helium pycnometer. It is applicable at a range of room temperatures of 15 to 35°C.

**2.4.2.14 SW846 9080/9081 — Cation-Exchange Capacity of Soils**

The procedures described in these methods describe the standard test to determine the cation-exchange capacity of soils by titration.

### **2.4.3 Analytical Methods for Organics and Inorganics**

#### **2.4.3.1 SW846/4425 (Draft) and/or ASTM E1853M-98 - PCDD/PCDF Screening**

The method is a screening procedure that will detect the total amount of planar compounds in solvent extracts of environmental samples of soil, sediment, and water. A reporter gene system (RGS) based on cytochrome P450 is utilized to screen samples for a range of organic compounds, including PCDDs and PCDFs. This method is based upon the toxic response of bioengineered mammalian cancer cells. The P450 RGS assay results are expressed as dioxin equivalents (TEQs) that can be used for risk assessment.

#### **2.4.3.2 SW846/8290 - PCDDs and PCDFs**

This method provides procedures for the detection and quantitative measurement of polychlorinated dibenzo-p-dioxins (tetra- through octachlorinated homologues; PCDDs), and polychlorinated dibenzofurans (tetra- through octachlorinated homologues; PCDFs) at part-per-trillion (ppt) to part-per-quadrillion (ppq) concentrations. The analytical method calls for the use of high-resolution gas chromatography and high-resolution mass spectrometry (HRGC/HRMS) on purified sample extracts. The sensitivity of this method is dependent upon the level of interferences within a given matrix.

#### **2.4.3.3 SW846/6010 – TAL Metals**

Selected samples will be analyzed for the Target Analyte List (TAL) metals.

Inductively coupled plasma-atomic emission spectrometry (ICP-AES) determines trace elements, including metals, in solution (6010). All matrices, excluding filtered groundwater samples but including ground water, aqueous samples, TCLP extracts, soils, sludges, sediments, and other solid wastes, require digestion prior to analysis. Groundwater samples that have been prefiltered and acidified will not need acid digestion.

#### **2.4.3.4 SW846 7420/7421 – Lead and Arsenic**

SW846 Methods 6010 or 7420/7421 will be used for the determination of lead and arsenic as confirmatory analyses. Method 7420 utilizes Flame Atomic Absorption spectrometry technique. In this technique, an aliquot of sample is aspirated into a flame where the sample is disassociated into the free state, making the analyte atoms available for absorption of light. Method 7421 utilizes Graphite furnace Atomic Absorption spectrometry technique. In this technique, an aliquot of sample is gradually heated to the temperature at which it is disassociated into the free state, making the analyte atoms available for absorption of light.

#### **2.4.3.5 SW846 7470/7471 – Mercury**

SW846 Methods 7470/7471 will be used for the determination of mercury. These methods utilize a chemical reduction to reduce mercury selectively.

#### **2.4.3.6 SW846 9010/9012 – Cyanide**

SW846 Methods 9010/9012 will be used for the determination of cyanide. Cyanide, as hydrocyanic acid (HCN), is released by refluxing the sample with strong acid and distillation of the HCN into an absorber-scrubber containing sodium hydroxide solution. The cyanide ion in the absorbing solution is then determined by automated UV colorimetry.

**2.4.3.7 SW846 8081 – Organochlorine Pesticides**

This method provides procedures for the detection and quantitative measurement of organochlorine pesticides. The analytical method calls for the use of gas chromatography equipped with an electron capture detector on sample extracts.

**2.4.3.8 SW846 8082 – Polychlorinated Biphenyl Compounds (PCBs)**

This method provides procedures for the detection and quantitative measurement of polychlorinated biphenyls. The analytical method calls for the use of gas chromatography equipped with an electron capture detector on sample extracts.

**2.4.3.9 SW846 8270 – Semivolatile Organic Compounds (SVOCs)**

This method provides procedures for the detection and quantitative measurement of selected semivolatile compounds. The analytical method calls for the use of gas chromatography mass spectrometry (GC/MS) on sample extracts.

**2.4.3.10 X-Ray Fluorescence (XRF)**

XRF is a non-destructive analytical technique used to determine the elemental composition of a sample. A field XRF analyzer will be used to determine the concentration of lead as a "screening" technique.

**2.4.3.11 SW846 1311/1312 - TCLP/SPLP Metals**

The IDW sample "leachates" will be measured for inorganic content. Methods SW-846 1311 and 1312 describe the leaching procedures in order to obtain a "leachate." The leachate will then be analyzed following the appropriate analytical method, for example, methods SW846/6010 and 7470/7471 (for the 8 RCRA metals, including mercury).

**2.4.3.12 SW846 1010/1020 - Ignitability; SW846 SW-846 7.3.3.2/7.3.4.2 – Reactivity; and SW846 1110/9040 – Corrosivity**

These methods are used to evaluate these three hazardous characteristics prior to land disposal.

**2.4.4 Analytical Laboratory**

Severn Trent Laboratories, Tallahassee (STL) will be used to analyze all samples except the dioxins/furans. The dioxins/furans analysis will be done by Paradigm Laboratories.

**2.4.5 Reporting Limits**

The reporting limits are listed in Table 2-2 through Table 2-6. The laboratory will supply analyte-specific quantification limits, with laboratory-specific IDL and MDL studies, as part of its laboratory quality assurance plan.

**2.4.6 Data Package Deliverables**

There are no data package requirements for Level 1 (screening results). The FTL is responsible to review the field logbooks, which will contain the following information for Level 1 field screening results.



Laboratory Level 3 (Definitive Data) QC data package deliverables are summarized in Table 2-7 by analytical fraction and will include sample results and QC summary forms, but not unreduced instrument data. Level 3 data packages will contain sufficient information so that sample analysis can be reconstructed, calculations can be verified, and a data quality assessment can be made to evaluate whether data meets project requirements.

## **2.5 Quality Control Requirements**

The following subtext describes the QC requirements that will be followed for this project.

### **2.5.1 Field QC Blank Samples and Duplicate Field Samples**

The type and frequency of field QC samples should be evaluated as part of the project planning process. In the following subsections, typical field QC blank samples and duplicate field samples are defined.

#### **2.5.1.1 Trip Blanks**

Trip blanks (TBs) are used to monitor potential VOC contamination introduced during sample shipping and handling. Trip blanks are 40-mL VOC vials of American Society for Testing and Materials (ASTM) Type II water that are filled in the laboratory, transported to the sampling site, and returned to the laboratory with the VOC samples. Trip blanks are prepared and analyzed for VOCs only. Trip blanks are not opened in the field. One trip blank will be included with each cooler containing samples for VOC analysis.

#### **2.5.1.2 Equipment Rinsate Blank Samples**

Equipment rinsate blanks (ERBs) are samples of ASTM Type II water passed through and over the surface of decontaminated sampling equipment. The rinse water is collected in sample bottles, preserved, and handled in the same manner that is used when collecting aqueous samples, even if the ERBs are being collected for soil samples. ERBs are used to monitor the effectiveness of the decontamination process. One ERB will be collected for each sampling event or each type of sampling equipment, whichever is more frequent, and analyzed for the same parameters as the corresponding samples.

#### **2.5.1.3 Field/Decontamination Water Blanks**

Field blanks (FBs) are samples of the source water used for decontamination and steam cleaning. This blank is used to monitor for potential contaminants present in the source water during field decontamination procedures. One FB will be collected for each source of water used for decontamination and analyzed for the same parameters as the corresponding samples.

#### **2.5.1.4 Temperature Blanks**

Temperature blanks are sent with each cooler shipped to the offsite laboratory containing samples requiring preservation at 4°C. Temperature blanks consist of a non-preserved VOC vial, or similar laboratory container, filled with ASTM reagent grade water. Temperature blanks are measured at the laboratory upon receipt to verify the temperature of the samples contained in the cooler. One temperature blank will be shipped with each cooler to each offsite lab.

### **2.5.1.5 Duplicate Field Samples**

Duplicate, or "blind," field samples are collected to monitor the precision of the field sampling process. The identity of the duplicate samples is not noted on the laboratory COC form. The FTL will choose at least 10 percent of the total number of sample locations known or suspected to contain moderate contamination, and duplicate field samples will then be collected at these locations. The identity of the duplicate samples will be recorded in the field sampling logbook, and this information will be forwarded to the data quality evaluation team to aid in reviewing and evaluating the data. The source of the field duplicate for the QA samples will be blind to the laboratory. The source of the field duplicate sample will be listed as a field sample on the COC form sent to the laboratory.

## **2.5.2 Laboratory QC Blank Samples**

### **2.5.2.1 Matrix Spike / Matrix Spike Duplicate Samples**

For MS/MSD samples, three aliquots of a single sample are analyzed: one native and two spiked with target compounds or metals. Spike recovery is used to evaluate potential matrix interferences as well as accuracy. The duplicate spike results (MS and MSD) are compared to evaluate precision. MS/MSDs will be collected at a frequency of five percent (one MS/MSD sample set for every 20 field samples) of the number of field samples.

## **2.5.3 Field and Laboratory Corrective Action**

The procedures that will be followed in identifying problems and performing corrective actions in the field and in the laboratory are described below.

### **2.5.3.1 Field Corrective Action**

The task manager (TM) is responsible for overseeing the corrective action process, but any team member may initiate it. The corrective action process consists of identifying a problem, acting to eliminate the problem, monitoring the effectiveness of the corrective action, verifying that the problem has been eliminated, and documenting the corrective action.

Documentation of the problem is important to overall management of the study. A corrective action request form for documenting the problems associated with sample collection is completed by the person discovering the QA problem. The corrective action request form identifies the problem, establishes possible causes, and designates the person responsible for action. The responsible person will be the project manager (PM), TM, or FTL. The QA manager will receive a copy of all corrective action request forms.

The form includes a description of the corrective action and has space for follow-up comments. The TM will verify that the initial action has been taken and that it appears to be effective and, at an appropriate later date, check to see if the problem has been fully resolved. The PM will receive a copy of all corrective action request forms and enter them into the corrective action log. This permanent record will aid the PM and QA manager during the follow up and will assist in resolving QA problems.

Examples of corrective action are correcting COC forms; problems associated with sample collection, packaging, shipping, or field record keeping; or additional training in sampling and analysis. Additional approaches may include resampling or evaluating and amending sampling procedures.

### 2.5.3.2 Laboratory Corrective Action

The laboratory department supervisors will review the data generated to verify that all QC samples have been run as specified in the procedure. Laboratory personnel are alerted that corrective actions may be necessary under the following conditions:

- Quality Control data are outside the warning or acceptable windows for precision and accuracy established for laboratory samples
- Blanks contain contaminants at concentrations above the levels specified in the laboratory quality assurance plan for any target compound
- Deficiencies are detected by the laboratory QA director during internal or external audits, or from the results of performance evaluation samples

Corrective actions are implemented immediately when nonconformances in QC sample results are identified by the bench analyst. Corrective action procedures are handled initially at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors and checks such parameters as instrument calibration, spike and calibration mixes, and instrument sensitivity.

The analyst immediately notifies his or her supervisor of the problem and the investigation being conducted. If the problem persists or cannot be identified, the matter must be referred to the laboratory supervisor and the QA/QC officer for further investigation. All laboratory QC problems that will affect the final data must be discussed with the project or program chemist as part of the corrective action process. Once resolved, full documentation of the corrective action procedure must be filed with the laboratory supervisor, and the QA/QC officer must be provided with a corrective action memorandum for inclusion in the project file if data are affected.

Corrective actions may include:

- Reanalyzing suspect samples
- Recalibration with new standards
- Eliminating blank contamination
- Resampling and analyzing new samples
- Evaluating and amending sampling and analytical procedures
- Accepting data with an acknowledged level of uncertainty
- Recalibrating analytical instruments
- Qualifying or rejecting the data

After implementation of the required corrective action measures, data that are deemed unacceptable may not be accepted by the PM, and follow-up corrective actions may be explored. Details of laboratory corrective actions are provided in the laboratory quality assurance plan.

## 2.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

This section describes the inspection/acceptance of environmental sampling and measurement systems/components to ensure their intended use as specified by the design

### 2.6.1 Field Instruments

All equipment used for field measurements will be maintained in accordance with the manufacturer's instructions. Routine maintenance and all equipment repairs will be documented in the site logbook. Whenever a piece of equipment fails to operate properly, the instrument either will be repaired in-house if possible, or sent out for repair, and another instrument equivalent to the original will be substituted, if possible.

Data will be generated from field methods for pH, temperature, conductivity, dissolved oxygen (DO), etc. QC procedures and calibration requirements for field methods are addressed in the following paragraphs. If procedures other than those listed below are to be used, or if modifications to approved procedures are proposed, a complete description will be submitted to the PM for approval before field use.

All equipment used for field measurements will be maintained in accordance with the manufacturer's instructions. Routine maintenance and all equipment repairs will be documented in the site log book. Whenever a piece of equipment fails to operate properly, the instrument either will be repaired in-house if possible, or sent out for repairs, and another instrument equivalent to the original will be substituted, if possible.

#### 2.6.1.1 Temperature Meter

This method is applicable to groundwater and surface water. Temperature measurements may be made with an analog or digital readout device or conductivity and pH meters that are equipped with a thermometer.

Prior to use, the equipment probe should be allowed enough time to equilibrate to the outside temperature when removed from a field vehicle. Insert the probe in situ when possible or in a grab sample. Swirl the probe in the sample and take the temperature reading when the readout needle stops moving; record temperature to the nearest 0.5°C. Routinely check the measurements device against a precision thermometer.

#### 2.6.1.2 Hydrogen Ion Concentration (pH) Meter

This method is applicable to groundwater and surface water. The pH of a sample is determined electrometrically using either a glass electrode in combination with a reference potential or a combination electrode and a pH meter.

In general, the glass electrode is not subject to solution interference from color, turbidity, colloidal matter, oxidants, reductants, or high salinity. Errors resulting from the presence of sodium at pH levels greater than 10 can be reduced or eliminated by using a "low sodium error" electrode.

Coatings of oily material or particulate matter can impair electrode response. Remove these coatings by gently wiping with a laboratory tissue followed by an ASTM Type II water rinse.

Temperature effects on the electrometric measurement of pH are controlled by using instruments with temperature compensation or by calibrating the electrode meter system at the temperature of the samples.

Poorly buffered solutions with low specific conductance values (less than 200  $\mu\text{mhos}$ ) may cause fluctuations in pH readings. Equilibrate the electrode by immersing it in several portions of sample before taking the pH measurement.

The general test procedures are as follows:

- Allow the meter to equilibrate to ambient temperature when it is removed from a field vehicle.
- Buffer the meter at the temperature of the buffer solution.
- If the sample temperature differs more than 2°C from the buffer solutions, adjust for the temperature differences.
- Thoroughly rinse the electrode with ASTM Type II water.
- Immerse the electrode in situ when possible or in a grab sample. Swirl the electrode at a constant rate until the meter reading reaches equilibrium. The rating of stirring used should minimize the air transfer rate at the air/water interface of the sample.
- Note and record sample pH. Repeat the measurement on successive volumes of sample or in situ until values differ by no less than 0.1 pH unit. Two or three volumes are usually sufficient.
- In the case of low specific conductance samples, such as those encountered with some groundwater, add 1 milliliter (mL) of 1-M potassium chloride solution per 100 mL of sample.

When the meter is moved to another sampling location, recheck the meter calibration by inserting the probe into the pH 7 buffer solution. The probe will be rinsed with ASTM Type II water before the probe is inserted or stored in the pH 7 buffer.

#### 2.6.1.3 Conductivity Meter

This method is applicable to groundwater and surface water. The specific conductance of a sample is measured by using a self-contained conductivity meter or a digital readout device that is equipped with a conductivity probe, as well as a pH, ORP, temperature, and DO probe. Measurements are made in situ or in a grab sample. Samples are preferably analyzed at 25°C. If not, temperature corrections are made the results reported at 25°C. Follow the instructions manual for the conductivity meter used.

#### 2.6.1.4 Dissolved Oxygen Meter

DO measurements are taken using a YSI Model 57 DO meter, or equivalent, with temperature probe. Air calibration is performed at least twice during each sampling event, at the start and at the finish. The meter is calibrated by adjusting the zero and red line, allowing 10 to 15 minutes for probe polarization in a plastic calibration chamber, reading probe temperature and, based on local altitude and the YSI calibration table, adjusting the meter to the appropriate calibration value. During periods of heavy use or adverse field conditions, calibration is performed more frequently, based on the scientist's discretion.

### 2.6.2 Analytical Laboratory Instruments

Preventive maintenance for laboratory instruments is discussed in greater detail in the laboratory's CompQAP.

It is required that designated laboratory personnel will be trained in routine maintenance procedures for all major instrumentation. Either trained staff or trained service engineers/technicians employed by the instrument manufacturer will make repairs. The laboratory shall have multiple instruments that will serve as backup to minimize potential down time. All maintenance will be documented and kept in permanent logs. These logs will be available for review by auditing personnel.

Laboratory equipment testing, inspection, and maintenance will be in accordance with the laboratory's quality assurance plan. The laboratory quality assurance plan shall discuss the schedule, procedures, criteria, and documentation for verifying that all analytical equipment is operating in an accurate and precise manner. To minimize instrument downtime, each laboratory shall have an internal instrument repair department or have a contract with a local instrument repair company.

## 2.7 Instrument Calibration and Frequency

Calibration procedures for field instruments and laboratory equipment are discussed below.

### 2.7.1 Field Instruments

Because instruments used during field investigation activities may be of several models and manufacturers, it is not feasible to present instrument-specific details in this section. Instead, instrument-specific calibration will be performed in accordance with the manufacturer's instructions, as provided in the instrument's SOP.

Field instruments will be calibrated daily in accordance with manufacturers' specifications before the beginning of sampling activities. Standards used to calibrate the field survey instruments will be traceable to the standards of the National Institute of Standards and Technology whenever possible. The method and frequency of calibration for the instruments used for each field activity are described in the manufacturer's instructions and summarized briefly below. These procedures will be followed at a minimum.

The pH, DO, ORP, and conductivity meters will be decontaminated before each sample is measured. The probes will be rinsed three times with ASTM Type II water before storage each day. The meters will be checked for battery charge and physical damage each day. The meters, pH standard solutions, and conductivity buffer solutions will be stored in a cool, dry environment. Standard solutions will be discarded on their expiration dates.

Instrument	Calibration Activity	Frequency
OVM-PID	Calibrate to isobutylene and zeroed to ambient air or background levels	Beginning of each sampling day
OVA	Calibrate to 100 ppm methane	Beginning of each sampling day
pH Meter	Calibrate against standard pH solutions (either 4.0 and 7.0 SU, or 7.0 and 10.0 SU)	Beginning of each sampling day. (Should verify calibration with a 7.0 buffer after each sampling location. If not 7.0 +/- 0.2, recalibrate pH meter)
Conductivity Meter	Check conductivity reading with a solution of known conductivity	Beginning of each sampling day

### **2.7.2 Laboratory Equipment**

Laboratory instruments will be calibrated in accordance with the manufacturer's directions and applicable method specifications. Laboratory instrument calibration procedures will be summarized in the laboratory quality assurance plan, which will be reviewed and approved by the PM or designee before samples are submitted for analysis. The lowest point of initial calibration (where applicable) should be at or below the project specified RL.

## **2.8 Inspection/Acceptance Requirements for Supplies and Consumables**

The laboratory services, including subcontracted services and supplies received from vendors, must meet the project scope, specified levels of quality, and the submittal schedule. The laboratory must evaluate the vendor's ability to provide the services and specify acceptance requirements for supplies and consumables. For example, laboratories rely on suppliers for solvents, gases, consumables, and analytical equipment, including instrument maintenance. The laboratory should have and maintain adequate contracts with their vendors to receive uninterrupted supplies, parts, and services.

## **2.9 Data Acquisition Requirements**

This subsection introduces the subject of data acquisition, shows the components of data acquisition, and provides a reference for more detailed information. Data acquisition is discussed in detail in the data management section of the work plan. The data management section also contains the electronic data deliverable requirements.

TABLE 2-1

Required Sample Containers, Preservation, and Holding Times

City of Jacksonville Ash Sites Jacksonville, Florida

Analyses	Analytical Method	Sample Matrix <sup>a</sup>	Container <sup>b</sup>	Qty	Preservative <sup>c</sup>	Holding Time <sup>g</sup>
Volatile Organic Compounds	SW-846 8260	W	40-mL glass	3	HNO <sub>3</sub> , pH < 2	14 days
		S	Encore or equivalent	1	Cool 4°C	48 hours to preservation, 14 days to analysis
Semivolatile Organic Compounds	SW-846 8270	W	2-L amber glass	1	Cool 4°C	7/40 days <sup>e</sup>
		S	8-oz glass	1	Cool 4°C	14/40 days <sup>f</sup>
TCLP – Semivolatile Organic Compounds	SW-846 1311/8270	S	8-oz glass	1	Cool 4°C	14/40 days <sup>f</sup>
Organochlorine Pesticides	SW-846 8081	W	2-L amber glass	1	Cool 4°C	7/40 days <sup>e</sup>
		S	8-oz glass	1	Cool 4°C	14/40 days <sup>f</sup>
TCLP – Organochlorine Pesticides	SW-846 1311/8081	S	8-oz glass	1	Cool 4°C	14/40 days <sup>f</sup>
Polychlorinated Biphenyls	SW-846 8082	W	2-L amber glass	1	Cool 4°C	7/40 days <sup>e</sup>
		S	8-oz glass	1	Cool 4°C	14/40 days <sup>f</sup>
TCLP – Polychlorinated Biphenyls	SW-846 1311/8082	S	8-oz glass	1	Cool 4°C	14/40 days <sup>f</sup>
Metals (Total)	SW-846 6010 /7000 Series	W	1-L polyethylene	1	Cool 4°C, HNO <sub>3</sub> , pH < 2	6 months
		S	2-oz glass	1	Cool 4°C	6 months
TCLP- Metals (Total)	SW-846 1311/ 6010 /7000 Series	S	8-oz glass	2	Cool 4°C	6 months
Mercury	SW-846 7470	W	1-L polyethylene	1	Cool 4°C, HNO <sub>3</sub> , pH < 2	28 days
	SW-846 7471	S	8-oz glass	2	Cool 4°C	28 days
TCLP – Mercury	SW-846 1311/7471	S	8-oz glass	1	Cool 4°C	28 days
Cyanide	Method 9010/9012	W	1-L polyethylene	1	Cool 4°C, pH>12 NaOH	14 days
		S	8-oz glass		Ascorbic Acid as needed(.6g)	
Lead	X-Ray Fluorescence	W	1-L polyethylene	1	Cool 4°C, HNO <sub>3</sub> , pH < 2	6 months
		S	2-oz glass	1	Cool 4°C	6 months
Dioxins/Furans	SW-846 8290	W	1-L amber glass	1	Cool 4°C	30/45 days <sup>e</sup>
		S	4-oz glass	2	Cool 4°C	30/45 days <sup>f</sup>
TOC	Method 9060	S	8-oz glass	1	Cool 4°C	28 days
Dioxins/Furans Screening	SW4425 (draft) or ASTM E1853M-98 - screening data)	W	1-L amber glass	1	Cool 4°C	30/45 days <sup>e</sup>
		S	4-oz glass	2	Cool 4°C	30/45 days <sup>f</sup>
pH	SW-846 9040	W	250-mL glass	1	None	24 hours
	SW-846 9045	S	4-oz glass	1	None	
Dissolved Oxygen	EPA 360.1	W	250-mL glass	1	None	As soon as possible
Temperature	EPA 170.1	W	250-mL glass	1	None	As soon as possible



## SECTION 2. MEASUREMENT AND DATA ACQUISITION

**TABLE 2-1**  
 Required Sample Containers, Preservation, and Holding Times  
*City of Jacksonville Ash Sites Jacksonville, Florida*

Analyses	Analytical Method	Sample Matrix <sup>a</sup>	Container <sup>b</sup>	Qty	Preservative <sup>c</sup>	Holding Time <sup>e</sup>
Turbidity	EPA 180.1	W	250-mL glass	1	None	As soon as possible
Conductivity	EPA 120.1	W	250-mL glass	1	None	As soon as possible
Reactivity	SW-846 7.3.3.2/7.3.4.2	W	2.5 L Amber <sup>h</sup>	1	None	As soon as possible
Corrosivity	SW-846 1110/9040	W	2.5 L Amber <sup>h</sup>	1	None	As soon as possible
Ignitability	SW-846 1010/1020	W	2.5 L Amber <sup>h</sup>	1	None	As soon as possible
Sulfide	EPA 376.2	W	250-mL polyethylene	1	Cool 4°C NaOH, Zinc Acetate	7 days
Sulfate	EPA 375	W	250-mL polyethylene	1	Cool 4°C	28 days
Nitrate	EPA 352.1	W	250-mL polyethylene	1	Cool 4°C	48 hours
Ammonia	EPA 350.1	W	250-mL polyethylene	1	Cool 4°C, H <sub>2</sub> SO <sub>4</sub>	28 days
TDS	EPA 160.1	W	250-mL polyethylene	1	Cool 4°C	7 days
TSS	EPA 160.2	W	250-mL polyethylene	1	Cool 4°C	7 days
Alkalinity	EPA 310.1	W	250-mL polyethylene	1	Cool 4°C	14 days
Cation Exchange Capacity of Soils	SW-846 9080.9081	S	4-oz glass	1	Cool 4°C	As soon as possible
Percent Moisture	ASTM D-2216	S	100g-clay, 200g-sand		None	NA
Full-size particle distribution	ASTM D-422 or D-1140 (hydrometer)	S	100g-clay, 200g-sand		None	NA
Bulk Density	D-4892-89	S			None	NA

**Notes:**

Sample container, and volume requirements will be specified by the analytical laboratory performing the tests. Three times the required volume should be collected for samples designated as MS/MSD samples.

<sup>a</sup>Sample matrix: S = surface soil, subsurface soil, sediment; W = surface water

<sup>b</sup>Glass containers will be sealed with Teflon®-lined screw caps.

<sup>c</sup>All samples will be stored promptly at 4°C in an insulated chest.

<sup>d</sup>VOC vials will be sealed with Teflon®-septa secured screw caps.

<sup>e</sup>7 days to extraction for water, 40 days for analysis.

<sup>f</sup>14 days to extraction for soil, 40 days for analysis.

<sup>g</sup>Holding times are from the time of sample collection.

Source: SW-846, third edition, Update III (June 1997).

<sup>h</sup>Reactivity, Corrosivity, and Ignitability can be obtained from the same container

## SECTION 2. MEASUREMENT AND DATA ACQUISITION

TABLE 2-2

Target Semivolatile Organic Compound Reporting Limits SW-846 Method 8270  
 City of Jacksonville Ash Sites Jacksonville, Florida

Target Compound	CAS RN	Water (µg/L)	Soil (µg/Kg)
Phenol	108-95-2	10	330
bis-(2-Chloroethyl)ether	111-44-4	10	330
2-Chlorophenol	95-57-8	10	330
2-Methylphenol	95-48-7	10	330
2,2'-oxybis(1-Chloropropane)	108-60-1	10	330
4-Methylphenol	106-44-5	10	330
N-Nitroso-di-n-propylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
bis(2-Chloroethoxy)methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
Naphthalene	91-20-3	10	330
4-Chloroaniline	106-47-8	10	330
Hexachlorobutadiene	87-68-3	10	330
4-Chloro-3-methylphenol	59-50-7	10	330
2-Methylnaphthalene	91-57-6	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4,5-Trichlorophenol	95-95-4	25	830
2-Chloronaphthalene	91-58-7	10	330
2-Nitroaniline	88-74-4	25	830
Dimethylphthalate	131-11-3	10	330
2,6-Dinitrotoluene	606-20-2	10	330
Acenaphthylene	208-96-8	10	330
3-Nitroaniline	99-09-2	25	830
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	25	830
4-Nitrophenol	100-02-7	25	830
Dibenzofuran	132-64-9	10	330

TABLE 2-2

Target Semivolatile Organic Compound Reporting Limits SW-846 Method 8270

City of Jacksonville Ash Sites Jacksonville, Florida

Target Compound	CAS RN	Water (µg/L)	Soil (µg/Kg)
2,4-Dinitrotoluene	121-14-2	10	330
Diethylphthalate	84-66-2	10	330
Fluorene	86-73-7	10	330
4-Chlorophenyl-phenyl ether	7005-72-3	10	330
4-Nitroaniline	100-01-6	25	830
4,6-Dinitro-2-methylphenol	534-52-1	25	830
N-Nitroso-diphenylamine	86-30-6	10	330
4-Bromophenyl-phenylether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	25	830
Phenanthrene	85-01-8	10	330
Anthracene	120-12-7	10	330
Carbazole	86-74-8	10	330
Di-n-butylphthalate	84-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330
Butylbenzylphthalate	85-68-7	10	330
3,3'-Dichlorobenzidine	91-94-1	10	330
Benzo(a)anthracene	56-55-3	10	330
Chrysene	218-01-9	10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330
Di-n-octylphthalate	117-84-0	10	330
Benzo(b)fluoranthene	205-99-2	10	330
Benzo(k)fluoranthene	207-08-9	10	330
Benzo(a)pyrene	50-32-8	10	330
Indeno(1,2,3-cd)-pyrene	193-39-5	10	330
Dibenzo(a,h)-anthracene	53-70-3	10	330
Benzo(g,h,i)perylene	191-24-2	10	330

TABLE 2-3

Target Pesticide SW-846 8081 and Polychlorinated Biphenyl SW-846 Method 8082 Compound Reporting Limits

City of Jacksonville Ash Sites Jacksonville, Florida

Target Compound	CAS RN	Water (µg/L)	Soil (µg/Kg)
alpha-BHC	319-84-6	0.05	1.7
beta-BHC	319-85-7	0.05	1.7
delta-BHC	319-86-8	0.05	1.7
gamma-BHC (Lindane)	58-89-9	0.05	1.7
Heptachlor	76-44-8	0.05	1.7
Aldrin	309-00-2	0.05	1.7
Heptachlor_epoxide	1024-57-3	0.05	1.7
Endosulfan I	959-98-8	0.05	1.7
Dieldrin	60-57-1	0.1	3.3
4,4'-DDE	72-55-9	0.1	3.3
Endrin	72-20-8	0.1	3.3
Endosulfan II	33213-65-9	0.1	3.3
4,4'-DDD	72-54-8	0.1	3.3
Endosulfan sulfate	1031-07-8	0.1	3.3
4,4'-DDT	50-29-3	0.1	3.3
Methoxychlor	72-43-5	0.5	17
Endrin ketone	53494-70-5	0.1	3.3
Endrin aldehyde	7421-93-4	0.1	3.3
alpha-Chlordane	5103-71-9	0.05	1.7
gamma-Chlordane	5103-74-2	0.05	1.7
Toxaphene	8001-35-2	5	170
Aroclor-1016	12674-11-2	1	33
Aroclor-1221	11104-28-2	2	67
Aroclor-1232	11141-16-5	1	33
Aroclor-1242	53469-21-9	1	33
Aroclor-1248	12672-29-6	1	33
Aroclor-1254	11097-69-1	1	33
Aroclor-1260	11096-82-5	1	33

TABLE 2-4

Target Dioxins/Furans SW-846 Method 8290 Compound Reporting Limits

## SECTION 2. MEASUREMENT AND DATA ACQUISITION

*City of Jacksonville Ash Sites Jacksonville, Florida*

Target Compound	CAS RN	Water (µg/L)	Soil (µg/Kg)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	0.010	0.0010
1,2,3,7,8-Pentachlorodibenzo-p-dioxins (PeCDD)	40321-76-4	0.010	0.0010
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	39227-28-6	0.025	0.0025
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	57653-85-7	0.025	0.0025
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	19408-74-3	0.025	0.0025
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	0.025	0.0025
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9	0.050	0.0050
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9	0.010	0.0010
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6	0.010	0.0010
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4	0.050	0.0050
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9	0.025	0.0025
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	57117-44-9	0.025	0.0025
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5	0.025	0.0025
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	72918-21-9	0.025	0.0025
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4	0.025	0.0025
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7	0.025	0.0025
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0	0.050	0.0050
<b>PCDD/PCDF Screening Method 4425 or ASTM E1853M-98</b>			
Dioxin/Furan Mixture		0.007	0.18

**TABLE 2-5**  
 Target Analyte Reporting Limits SW-846 Method 6010/7000/9000  
 City of Jacksonville Ash Sites Jacksonville, Florida

Target Analyte	CAS RN	Water (µg/L)	Soil (mg/Kg)
Aluminum	7429-90-5	200	40
Antimony	7440-36-0	60	12
Arsenic (7421 or 6010)	7440-38-2	10	1.0
Barium	7440-39-3	200	40
Beryllium	7440-41-7	5.0	1.0
Cadmium	7440-43-9	5.0	1.0
Calcium	7440-70-2	5000	1000
Chromium	7440-47-3	10	2.0
Cobalt	7440-48-4	50	10
Copper	7440-50-8	25	5.0
Iron	7439-89-6	100	2.0
Lead (7421 or 6010)	7439-92-1	3.0	0.6
Magnesium	7439-95-4	5000	1000
Manganese	7439-96-5	15	3.0
Mercury (7470, 7471)	7439-97-6	0.2	0.1
Nickel	7440-02-0	40	8.0
Potassium	7440-09-7	5000	1000
Selenium	7782-49-2	5.0	1.0
Silver	7440-22-4	10	2.0
Sodium	7440-23-5	5000	1000
Thallium	7440-28-0	10	2
Vanadium	7440-62-2	50	10
Zinc	7440-66-6	20	4
Cyanide (9010B, 9012A)	57-12-5	10	50

TABLE 2-6

Miscellaneous Target Analytical Parameter Reporting Limits

City of Jacksonville Ash Sites Jacksonville, Florida

Analytical Parameter	CAS Number	Water (ug/L)	Soil (mg/kg)
Alkalinity	na	1000	N/A
Ammonia	7664-41-7	30	0.50
Cation Exchange Capacity of Soils	na	N/A	0.50 meq/100 g
BOD <sub>5</sub>	na	2000	N/A
COD	na	20000	N/A
Conductivity	1-01-1	N/A	N/A
Corrosivity	na	N/A	N/A
Dissolved Oxygen	7782-44-7	100	N/A
Ignitability	na	N/A	N/A
Phenols	na	10	1.0
Reactive-CN/S	na	N/A	100/50 mg/kg waste
pH	12408-02-5	N/A	N/A
Redox Potential	na	N/A	N/A
Nitrate - N		50	5.0
Sulfate	1408-79-8	5000	100
Sulfide	18496-25-8	100	25
Temperature	na	N/A	N/A
TOC	na	1000	500
TDS	na	5000	N/A
TSS	na	5000	N/A
Turbidity	3-01-6	0.10 NTU	N/A
Geotechnical Parameters			
Grain Size	na	na	na
Grain size distribution	na	na	na
Percent Moisture	na	na	na
Atterburg Limits	na	na	na
Full-size particle distribution	na	na	na
Strength Testing	na	na	na

TABLE 2-7

Data Package Deliverables

City of Jacksonville Ash Sites Jacksonville, Florida

## All Analytical Fractions

Case Narrative – A detailed case narrative for each analytical fraction is required and will include explanation of any non-compliance and/or exceptions, corrective action taken, and outcome of corrective action. Exceptions will be noted for receipt, holding times, analytical methods, preparation, calibration, blanks, spikes, surrogates (where applicable), and sample exceptions.

Sample ID Cross Reference Sheet (Lab ID's and Client ID's)

Completed Chain of Custody and any sample receipt information

Copies of non-conformance memos and corrective actions

Form *	Organic Fractions	GC/MS	GC
1	Sample results w/ lab sample ID, client sample ID, and station ID	•	•
2	Surrogate Recovery Summary (w/ applicable control limits)	•	•
3	MS/MSD Accuracy & Precision Summary with RPD calculated according to method specifications (CLP using % recovery, SW-846 using concentration) – including spike added, percent recovery, and applicable control limits	•	•
3	LCS Accuracy Summary (including spike added, percent recovery, and applicable control limits)	•	•
4	Method Blank Summary	•	•
5	Instrument Tuning Summary (including tuning summary for applicable initial calibrations)	•	
6	Initial Calibration Summary (including concentration levels of standards)	•	
6	Initial Calibration Summary (Retention Times (RT), Response or Calibration Factors, and linearity demonstration)		•
7	Continuing Calibration Summary	•	
7	Continuing Calibration Summary (Unique Instrument/Column ID, RTs, RT windows, calibration or response factors, percent difference or drift – as appropriate to method)		•
7	Degradation Summary (Organochlorine Pesticides only)		•
8	Internal Standard Summary (including internal standard summary for applicable initial calibrations)	•	
8	Analytical Sequence - For every analysis associated with a particular analytical sequence starting with the initial calibration, enter the client sample identification, lab sample identifier, and date and time of analysis. Each sample analyzed as part of the sequence shall be reported on Form 8 even if it is not associated with the batch/SDG. The laboratory shall use ZZZZZ as the client sample identification to distinguish all samples that are not part of the batch/SDG being reported.		•
10	Compound Identification Summary (where confirmation required) – including RT, RT windows, concentrations for detected compounds on both columns, and percent difference between results		•



**TABLE 2-7**

Data Package Deliverables

City of Jacksonville Ash Sites Jacksonville, Florida

Form *	Inorganic Fractions	Metals	General Chemistry
1	Sample Results (with lab ID, sample ID, <u>and</u> station ID)	•	•
2A	Initial and Continuing Calibration Summary	•	•
3	Initial and Continuing Calibration Blanks and Method Blanks Summary	•	•
4	Interference Check Standard Summary	•	
5A	Pre-digestion Matrix Spike Recoveries Summary	•	•
6	Native Duplicate or MS/MSD Precision Summary	•	•
7	Laboratory Control Sample Recovery Summary	•	•
8	Method of Standard Addition (if necessary)	•	
8	Serial Dilution	•	
10	Instrument or Method Detection Limit Summary	•	•
12	Linear Range Summary	•	
13	Preparation Log Summary	•	
14	Analytical Run Sequence and GFAA Post-spike Recovery Summary	•	

\* CLP Form or summary form with equivalent information.

## SECTION 3

## Assessment and Oversight

---

Assessment and oversight activities are performed to determine whether the QC measures identified in the Work Plan and this QAPP are being implemented and documented as required. Audits and reviews are the tools used to implement this process. For example, during a review, the auditor may check that a monitor well has been correctly sampled or that the field QC samples were collected at the appropriate frequency. During an audit or review, the auditor may check for:

- Adherence to the Work Plan
- Documentation of the process or system
- Proper identification, resolution, and documentation of nonconformance with the process or system
- Correction of identified deficiencies

### 3.1 Assessments and Response Actions

The need for an audit can be determined independently by the PM. Assessment activities may include surveillance, inspection, peer review, management system review, readiness review, technical systems audit, performance evaluation, and data quality assessment. The PM will be responsible for initiating audits, selecting the audit team, and overseeing audit implementation.

The laboratory will be audited in accordance with the laboratory subcontract. The project chemist or designee will perform laboratory audits in compliance with the subcontract

Field audits will be conducted by a review team member as designated by the PM.

#### 3.1.1 Laboratory Performance and Systems Audits

Laboratory systems will be audited in accordance with the project-specific requirements. Contracted laboratories must submit a Laboratory CompQAP. The CompQAP must reference relevant SOPs and the laboratory's internal procurement policies and corrective action program.

The laboratory audits will address at least the following issues:

- Is the laboratory operation being performed as required by the subcontract?
- Are internal laboratory operations being conducted in accordance with the laboratory CompQAP?
- Are the laboratory analyses being performed in accordance with method requirements?

Any nonconformance noted during an audit will result in a corrective action.

### 3.1.2 Field Team Performance and System Audits

The PC or other member of the review team as designated by the PM may conduct an audit of the field activities in accordance with the program requirements. The audit will address at least the following issues:

- Are sampling operations being performed as stated in the Work Plan?
- Are the sample labels being filled out completely and accurately?
- Are the COC records complete and accurate?
- Are the field notebooks being filled out completely and accurately?
- Are the sampling activities being conducted in accordance with the Work Plan and approved SOPs?
- Are the documents generated in association with the field effort being stored as described in the Work Plan?

The generation and documentation of field data will also be audited. Audits will focus on verifying that proper procedures are followed so that subsequent sample data will be valid. Any nonconformance noted during an audit will result in a corrective action.

The results of the assessment and oversight activities will be reported back to the PM, who has ultimate responsibility for ensuring that the corrective action response is completed, verified, and documented.

## 3.2 Reports to Management

Reports to the PM include project status reports, the results of evaluation and system audits, data quality assessments, and significant QA problems and recommended solutions. The status reports, submitted in accordance with the requirements of site-specific work plan, will discuss at least current activities, problems encountered and their resolution, and planned work.

QA reports will be submitted in accordance with the site-specific work plan. QA reports document implementation of the QAPP and the results of the site-specific QA/QC audits. A final QA report must be submitted as part of each project's final report. The topics to be covered are outlined in the site-specific work plan, but each will include at least the following information:

- Identification of nonconformances that required corrective action and resolution of the nonconformance
- Data quality assessment in terms of precision and accuracy and how they affect the usability of the analytical results
- Limitations of the qualified results and a discussion of rejected results
- Discussion of the field and laboratory QA/QC sample results
- Results of external laboratory audits

## SECTION 4

## Data Validation and Usability

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This section addresses the QA activities that occur after the data collection has been completed. Implementation of these elements, which include data review, validation, and reconciliation, will determine the extent to which the data conform to the specified criteria and satisfy the project objectives.

### 4.1 Data Review, Validation, and Verification Requirements

Data review and validation are processes whereby data generated in support of this project are reviewed against the QA/QC requirements. The data are evaluated for precision, accuracy, and completeness against the analytical protocol requirements. Nonconformances or deficiencies that could affect the usability of data are identified as noted. The types of data that will be validated are described further in the following subsections.

#### 4.1.1 Level 1–Field Measurements

Field instruments used to collect field survey (or bulk measurements such as pH or conductivity) are direct reading, thus making field calculations and subsequent data reduction unnecessary. Field data will be recorded in the site log books by appropriately trained field personnel. Field data will include the following:

- Instrument identification
- Calibration information (standards used and results)
- Date and time of calibration and sample measurement
- Sample results
- Supporting information if appropriate

Data will be reviewed by the FTL, who is responsible for the collection and verification of all field data while in the field. Recorded data will be accepted or rejected by the FTL before leaving the sampling site. Extreme readings (readings that appear significantly different from other readings at the same site) will be accepted only after the instrument has been checked for malfunction and/or if the readings are verified by re-testing.

Field documentation, sample data, instrument calibrations, and QC data will be reviewed by the PM (or a designee) before being included in the project files.

#### 4.1.2 Level 2–Physical Parameters and IDW Characterization

The data package deliverables associated with Level 2 are listed below. The data package will be reviewed by the PC for completeness and correctness. No further validation will be performed.

- Case Narrative
- Sample results

- Selected QC information such as surrogate recovery
- Associated blank results
- Completed COC and any sample receipt information

#### 4.1.3 Level 3–Laboratory Analyses

The data package deliverables associated with Level 3 are listed in Table 2-4. Level 3 contains the QC summary forms.

Definitive data can be generated by a variety of measurements, ranging from onsite field analyses to laboratory analyses. In the evaluation of definitive data, not all data require the same effort for validation.

100 percent of the laboratory/definitive data generated in support of this project will be validated.

### 4.2 Validation and Verification Methods

The PC or designee will perform data quality evaluation. The data quality evaluation process is used to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance with the method requirements. It is a straight-forward examination—either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of the matrix interferences is more subtle and involves analysis of several results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

Before the analytical results are released by the laboratory, both the sample and QC data will be reviewed carefully to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data will be reduced and spike recoveries will be included in control charts, and the resulting data will be reviewed to ascertain whether they are within the laboratory-defined limits for accuracy and precision. Any non-conforming data will be discussed in the data package cover letter and case narrative. The laboratory will retain all of the analytical and QC documentation associated with each data package.

The data package will be reviewed by the PCs using the process outlined in the guidance documents, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA, 1994) and Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA, 1994). For non-CLP methods, the validation will be performed in a process analogous to the National Functional Guidelines, but will use QC criteria established in the method. The data review and validation process is independent of the laboratory's checks. It focuses on the usability of the data to support the project data interpretation and decision-making process. Areas of review include data package completeness, holding time compliance, initial and continuing calibration, spiked sample results, method blank results, and duplicate sample results. A data review worksheet will be completed for each data package. Acceptance criteria for each area of review are specified in the analytical method. For example, acceptance criteria for initial and continuing calibration are specified in each analytical method; any non-conformances will be noted on the data

review worksheets and the effect of the non-conformance on the overall usability of the data will be evaluated as part of the overall data quality evaluation.

Sample results that do not meet the acceptance limit criteria will be indicated with a qualifying flag, which is a one or two-letter abbreviation that indicates a possible problem with the data. Flags used in the text may include the following:

- **U** Undetected. Samples were analyzed for this analyte, but it was not detected above the method detection limit (MDL) or instrument detection limit (IDL).
- **UJ** Detection limit estimated. Samples were analyzed for this analyte, but the results were qualified as not detected. The result is estimated.
- **J** Estimated. The analyte was present, but the reported value may not be accurate or precise.
- **R** Rejected. The data are unusable. (NOTE: Analyte/compound may or may not be present.)

It is important to note that laboratory qualifying flags are included on the data summary forms (Form I) that are submitted to the project by the laboratory. However, during the data review and validation process, the laboratory qualifying flags are evaluated and replaced with the project-specific validation flags.

#### 4.2.1 Field and Laboratory Blank Contamination

The appearance and concentration of target compounds in field and laboratory blanks as well as environmental samples will be reviewed. Common field sampling and laboratory contaminants detected in blanks include acetone, methylene chloride, and phthalates. Acetone and methylene chloride are used to extract samples in the laboratory, and hence, are common laboratory contaminants. Phthalates are used as plasticizers, the most common of which is bis(2-ethylhexyl) phthalate, and are often introduced during sample handling.

#### 4.2.2 Surrogate Spike Recoveries

Surrogate spike compounds are added to each sample for the organic analytical methods. Surrogate spike compounds are structurally similar (but not identical) to target compounds and should behave in a similar manner during analysis. Surrogate spike recoveries are used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks are used to evaluate laboratory performance because these blanks represent an ideal sample matrix. Surrogate spike recoveries for field samples are used to evaluate the potential for matrix interferences. When surrogate spike recoveries for field samples fall outside the method target acceptance windows, the samples are re-extracted if appropriate, then re-analyzed. If the surrogate spike recovery is still outside the acceptance window for the re-analyzed sample, then the sample results are qualified as affected by matrix interferences.

#### 4.2.3 Matrix Spike Recoveries

For this QC measure, three aliquots of a single sample are analyzed—one native and two spiked with the same concentration of matrix spike compounds. Unlike the surrogate spike compounds, matrix spike compounds are found on the method target compound list. Spike

recovery is used to evaluate potential matrix interferences, as well as accuracy. The duplicate spike results are compared to evaluate precision.

#### **4.2.4 Laboratory Control Samples**

An aliquot of ASTM type II water or appropriate solid matrix is spiked with target analytes or compounds at concentrations in the middle of the linear calibration range, and then prepared and analyzed with a batch of samples. The laboratory control sample is used to QC a preparation batch.

#### **4.2.5 Duplicate Sample Results**

Duplicate samples will be collected and analyzed as part of the field effort. Both the native and duplicate samples will be analyzed for the same parameters. Target compounds that are detected in both the native and duplicate samples will be compared and the precision estimated for the sample results calculated.

#### **4.2.6 Trend Analysis**

Once each of the data packages has been reviewed, and the data review worksheets completed, then the entire data set will be evaluated for overall trends in data quality and usability. Information summarized as part of the data quality evaluation may include chemical compound frequencies of detection, dilution factors that might affect data usability, and patterns of target compound distribution. The data set also will be evaluated to identify potential data limitations or uncertainties in the laboratory. Additional areas of review are listed below.

### **4.3 Reconciliation with Data Quality Objectives**

The final activity of the data validation process is to assess whether the data meet the planned DQOs for the project. The final results, as adjusted for the findings of any data validation/data evaluation, will be checked against the DQOs, and an assessment will be made as to whether the data are of sufficient quality to support the DQOs. The decision as to data sufficiency may be affected by the overall precision, accuracy, and completeness of the data as demonstrated by the data validation process. If the data are sufficient to achieve project objectives, the task manager will release the data and work may proceed. If the data are insufficient, a corrective action will be required.

## SECTION 5

## References

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U.S. Environmental Protection Agency. *Guidance for the Data Quality Objectives Process*. External Working Draft. EPA QA/G-4. Quality Assurance Division. United States Environmental Protection Agency, Washington DC. 1996a.

U.S. Environmental Protection Agency. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*. EPA QA/R-5. Quality Assurance Division. United States Environmental Protection Agency, Washington DC. 1996b.

U.S. Environmental Protection Agency. *Test Methods for Evaluating Solid Waste. Physical/Chemical Methods*. SW-846. Office of Solid Waste and Emergency Response, Washington, DC. 1992.

American Society for Testing and Materials. ASTM Annual Book of Standards. 1993.

U.S. Environmental Protection Agency, 1983. *Methods for Chemical Analysis of Water and Wastes*.

U.S. Environmental Protection Agency (EPA). *U.S. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review*. Publication 9240.1-05 EPA-540/R-94/012 PB94-963501. Office of Solid Waste and Emergency Response, Washington DC. 1994a.

U.S. Environmental Protection Agency. *U.S. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Data Review*. Publication 9240.1-05-01 EPA-540/R-94/013 PB94-963502. Office of Emergency and Remedial Response, Washington DC. 1994b.

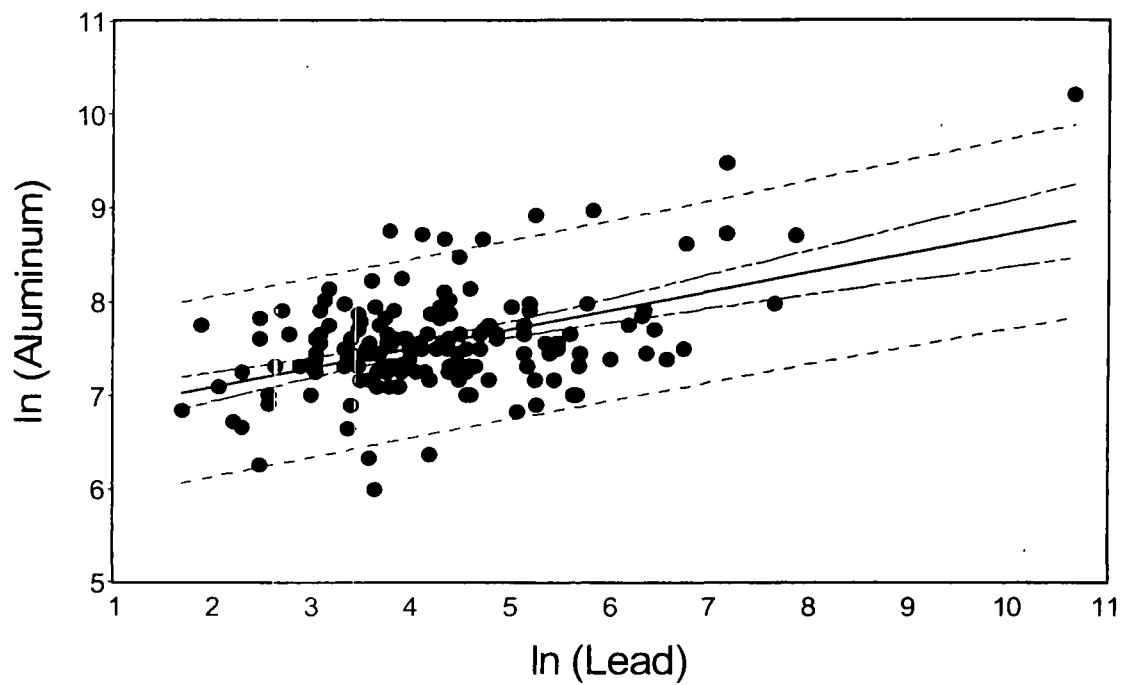


## **Appendix H**

### **Correlation Plots for the COPECs**

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## Lead vs Aluminum

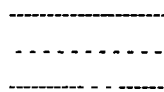


## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean



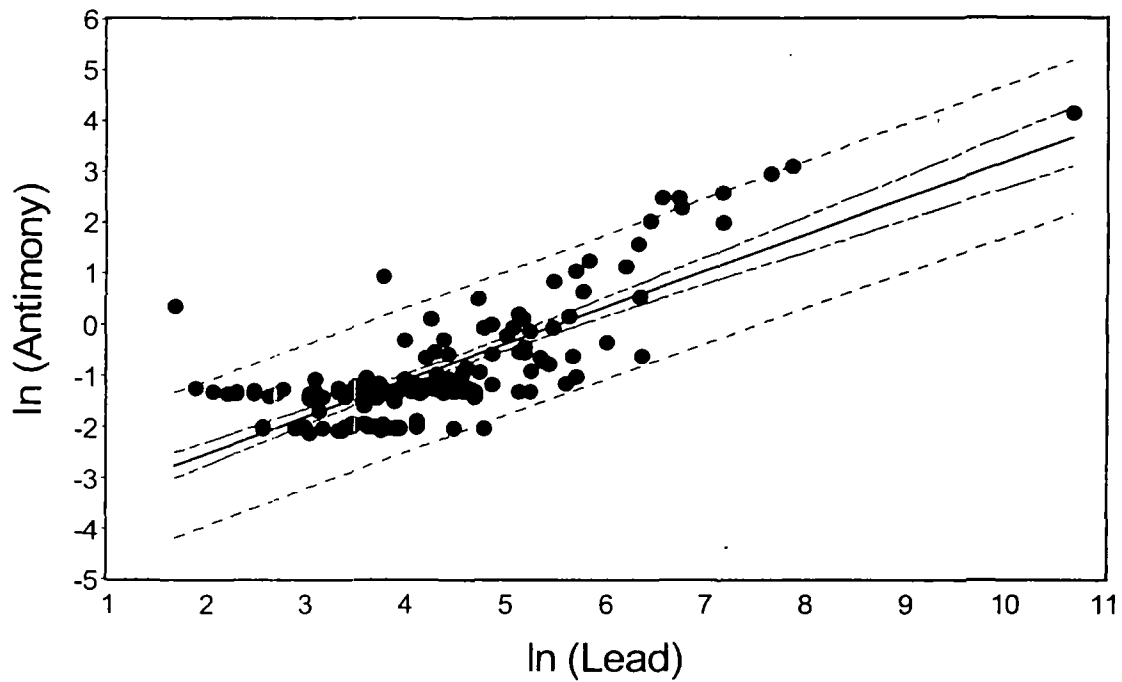
Regression equation =  $\ln(\text{aluminum ppm}) = 6.68 + 0.2 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.20

Intercept = 6.68

$R^2 = 22\%$

## Lead vs Antimony



### Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean



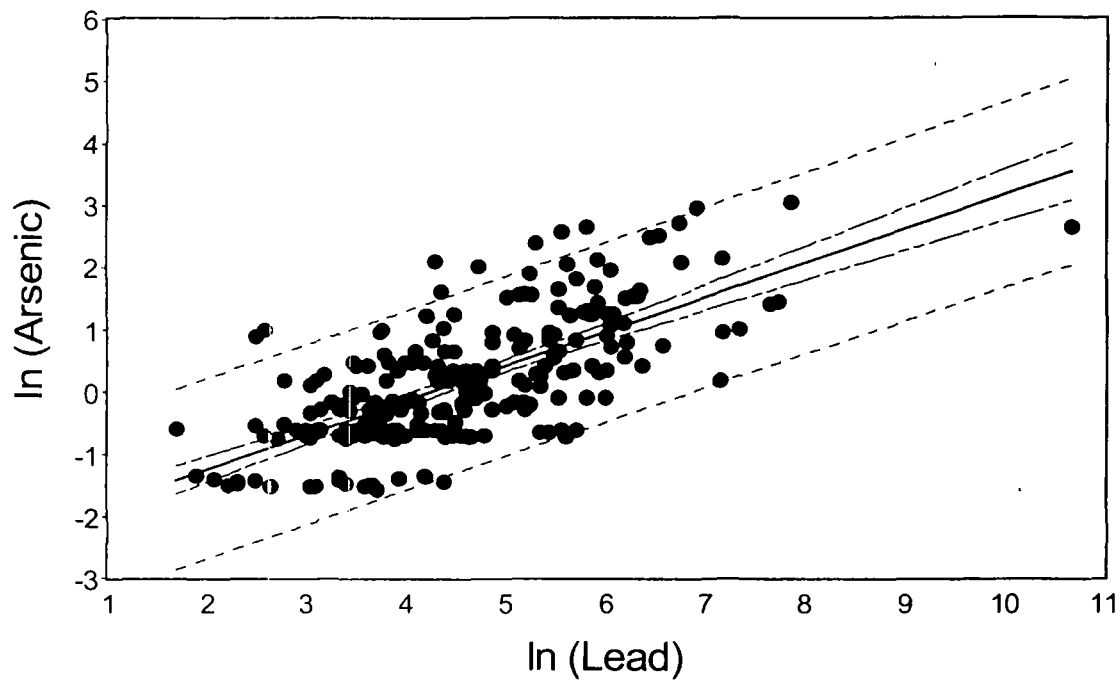
Regression equation =  $\ln(\text{antimony ppm}) = -3.95 + 0.71 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.71

Intercept = -3.95

$R^2 = 61\%$

## Lead vs Arsenic



## Legend

Regression best fit line	-----
95% prediction limit for next concentration pair	.....
95% confidence limits about the mean	-----

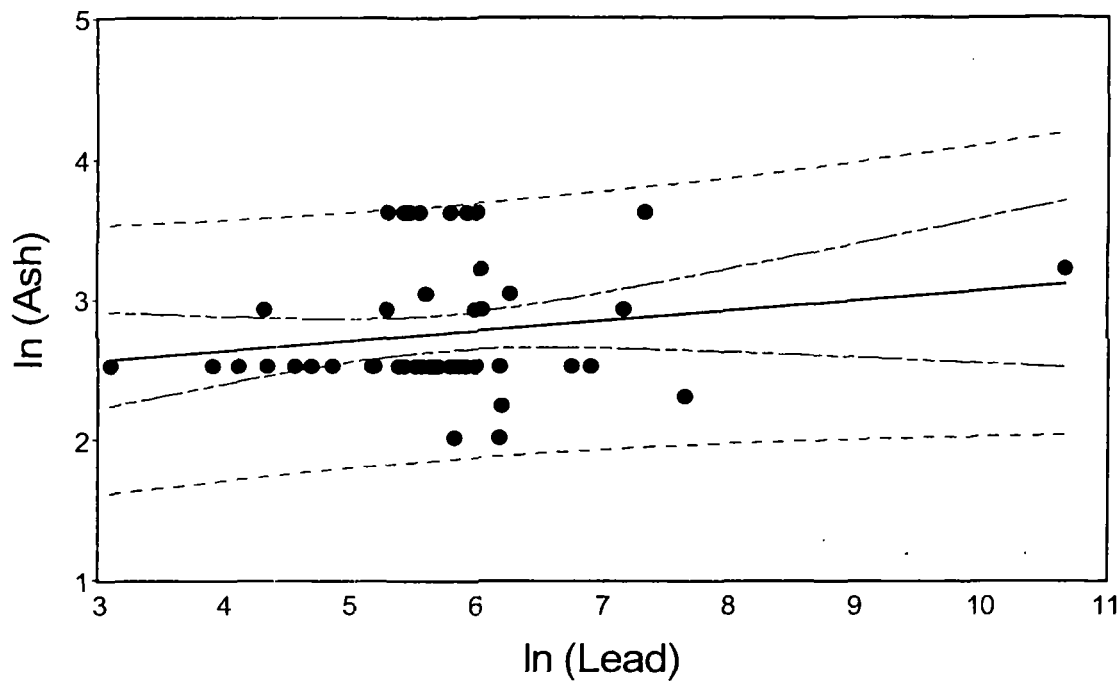
Regression equation =  $\ln(\text{arsenic ppm}) = -2.34 + 0.55 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.55

Intercept = -2.34

$R^2 = 47\%$

## Lead vs Ash



## Legend

Regression best fit line	—————
95% prediction limit for next concentration pair	- - - - -
95% confidence limits about the mean	.....

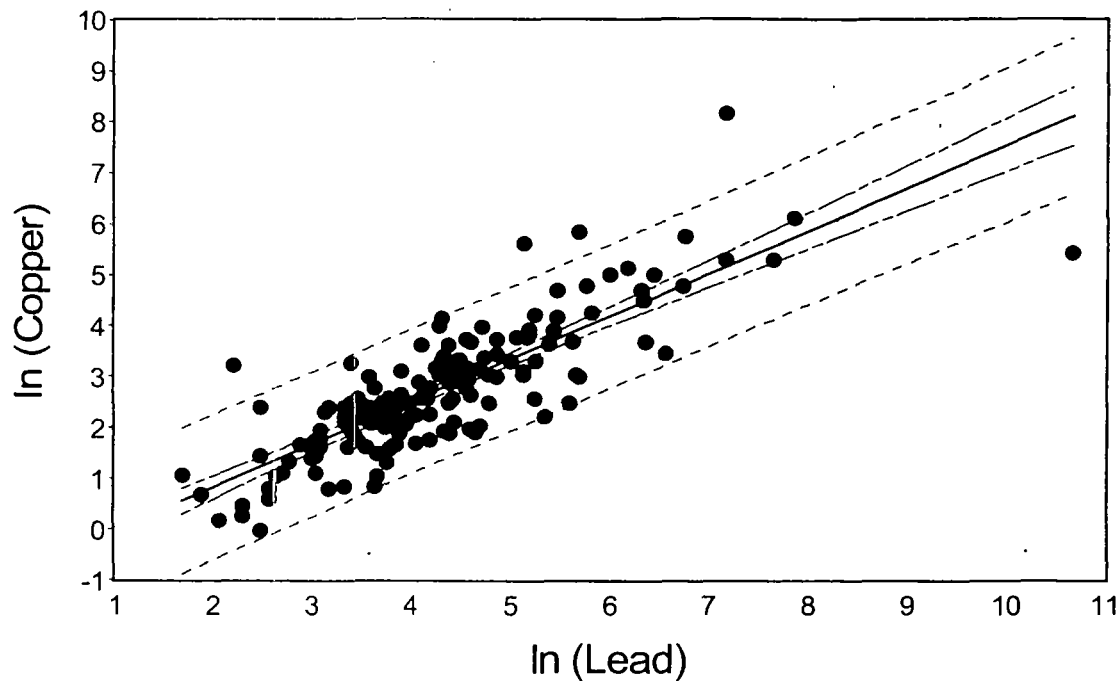
Regression equation =  $\ln(\text{ash \%}) = 2.35 + 0.07 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.07

Intercept = 2.35

$R^2 = 3\%$

## Lead vs Copper

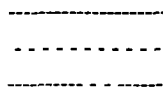


## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean



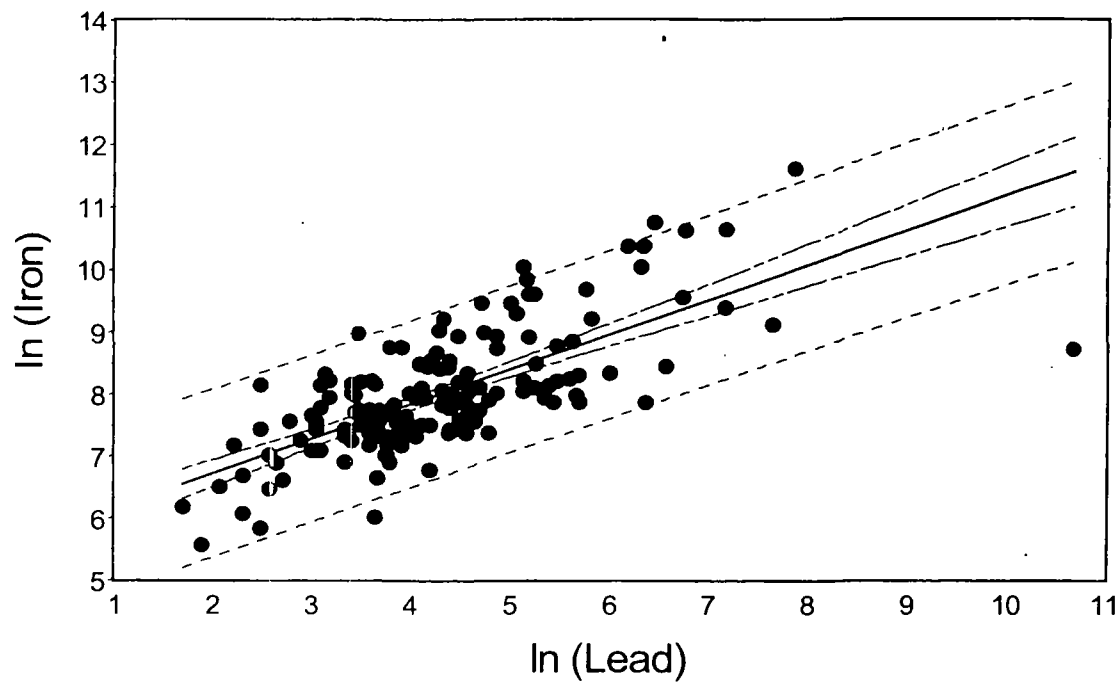
Regression equation =  $\ln(\text{copper ppm}) = -0.86 + 0.84 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.84

Intercept = -0.86

$R^2 = 68\%$

## Lead vs Iron



## Legend

Regression best fit line                      —————  
95% prediction limit for next concentration pair                      - - - - -  
95% confidence limits about the mean                      - - - - -

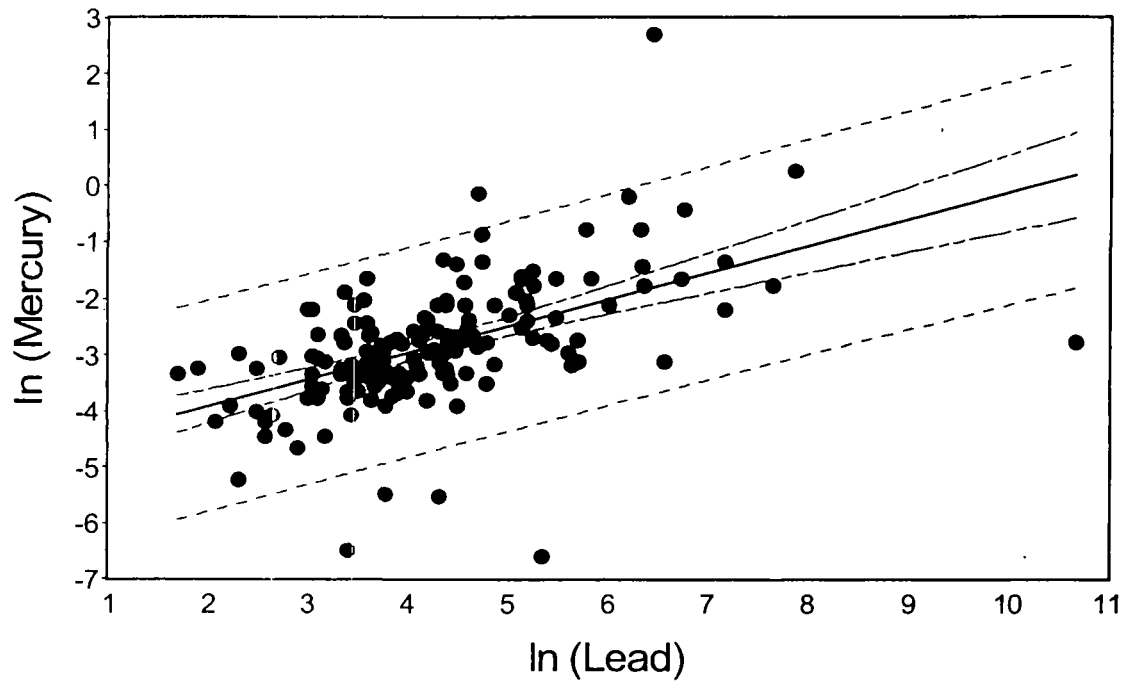
Regression equation =  $\ln(\text{iron ppm}) = 5.61 + 0.56 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.56

Intercept = 5.61

$R^2 = 51\%$

## Lead vs Mercury



## Legend

Regression best fit line	—————
95% prediction limit for next concentration pair	.....
95% confidence limits about the mean	-----

Regression equation =  $\ln(\text{mercury ppm}) = -4.86 + 0.47 \times \ln(\text{lead ppm})$

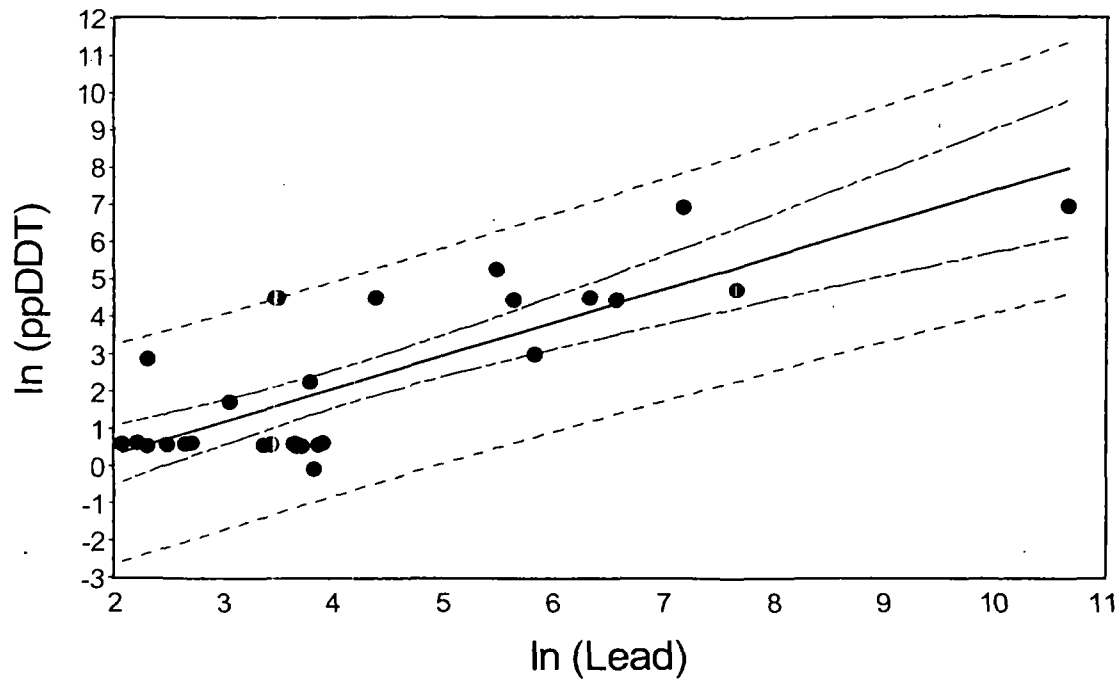
Regression Coefficient = 0.47

Intercept = -4.86

$R^2 = 28\%$



## Lead vs ppDDT



## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean

Regression equation =  $\ln(\text{pp-DDT ppm}) = -1.47 + 0.88 \times \ln(\text{lead ppm})$ 

Regression Coefficient = 0.88

Intercept = -1.47

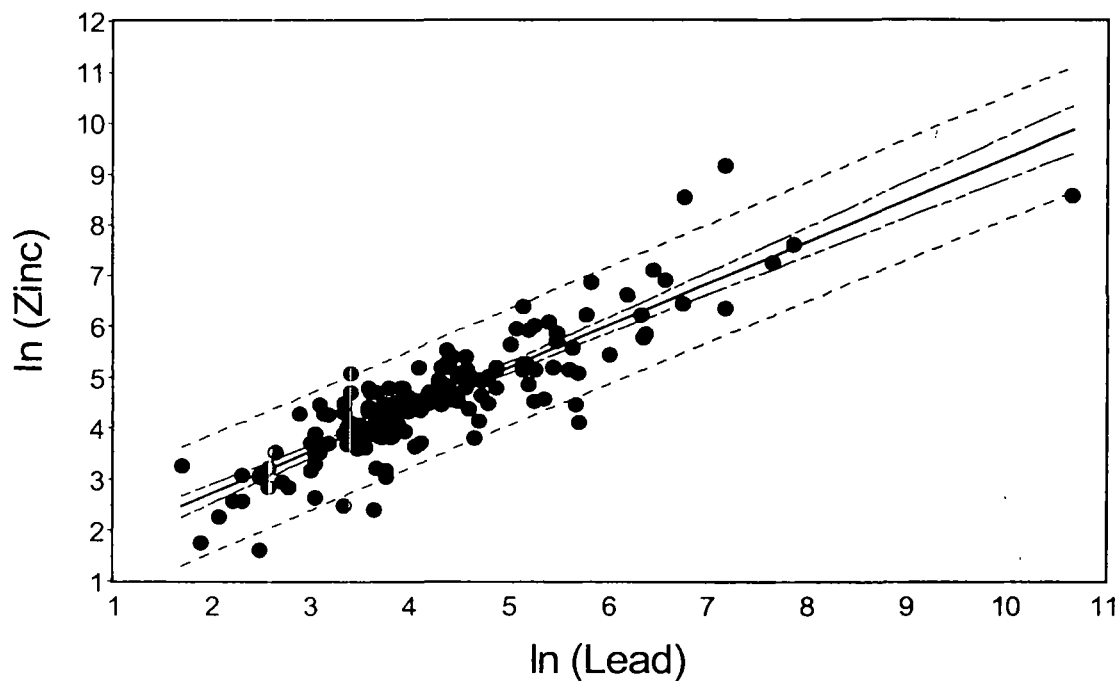
 $R^2 = 60\%$

3 4 . 0356

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APPENDIX H

## Lead vs Zinc



## Legend

Regression best fit line                      —————  
95% prediction limit for next concentration pair                      - - - - -  
95% confidence limits about the mean                      - - - - -

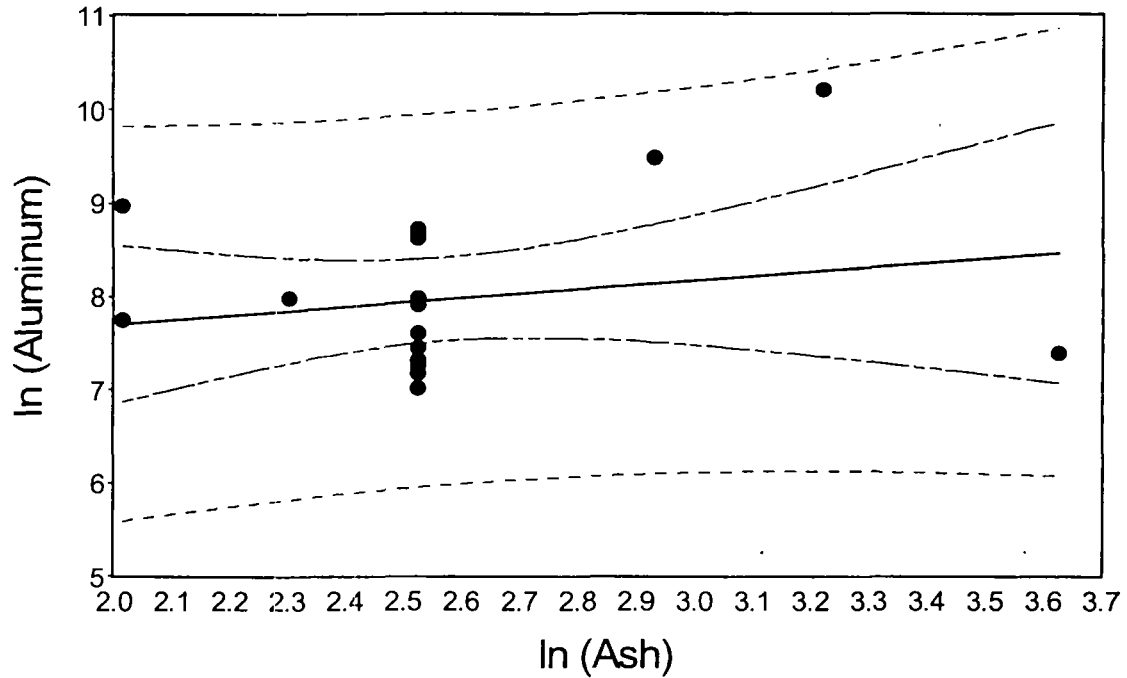
Regression equation =  $\ln(\text{zinc ppm}) = 1.07 + 0.82 \times \ln(\text{lead ppm})$

Regression Coefficient = 0.82

Intercept = 1.07

$R^2 = 76\%$

## Ash vs Aluminum



## Legend

Regression best fit line	-----
95% prediction limit for next concentration pair	.....
95% confidence limits about the mean	-----

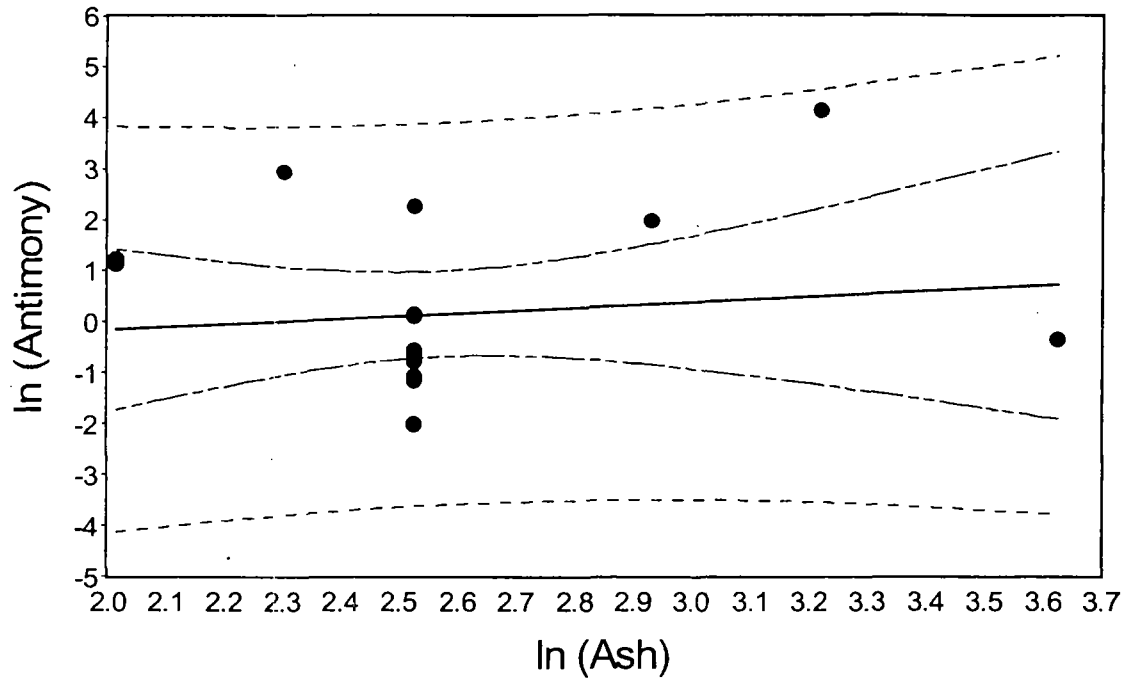
Regression equation =  $\ln(\text{aluminum ppm}) = 6.76 + 0.47 \times \ln(\text{ash \%})$

Regression Coefficient = 0.47

Intercept = 6.76

$R^2 = 3\%$

## Ash vs Antimony

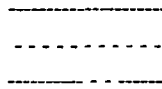


## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean



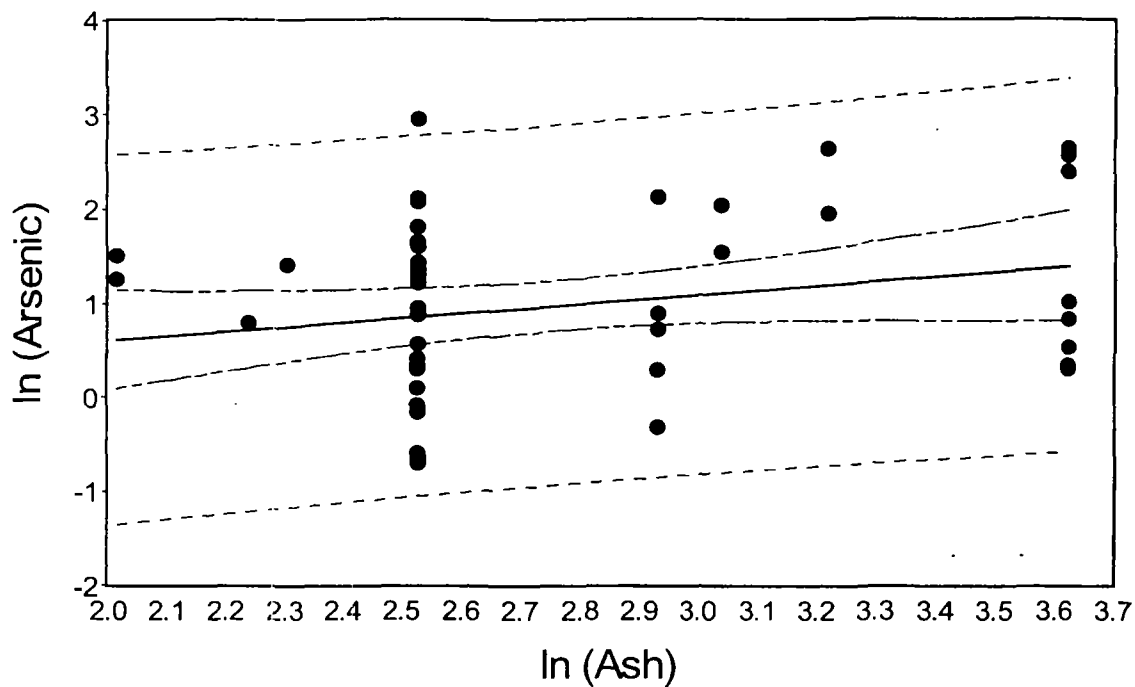
Regression equation =  $\ln(\text{antimony ppm}) = -1.22 + 0.53 \times \ln(\text{ash \%})$

Regression Coefficient = 0.53

Intercept = -1.22

$R^2 = 1\%$

## Ash vs Arsenic



## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean

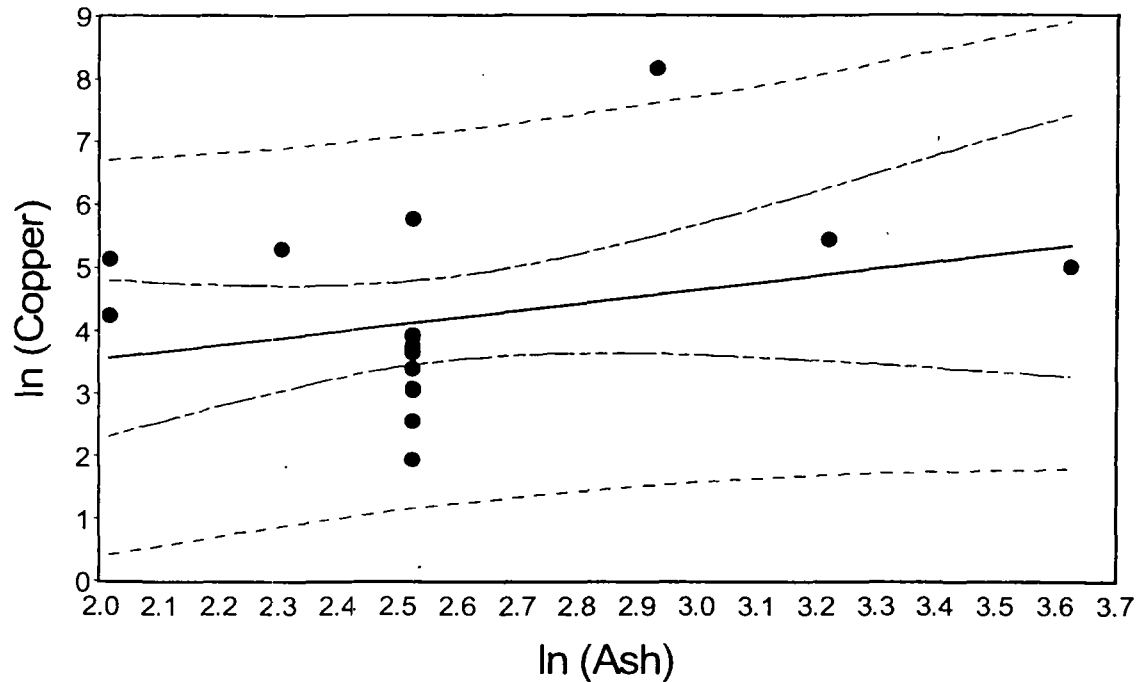
Regression equation =  $\ln(\text{arsenic ppm}) = -0.37 + 0.49 \times \ln(\text{ash \%})$ 

Regression Coefficient = 0.49

Intercept = -0.37

 $R^2 = 5\%$

## Ash vs Copper



## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean

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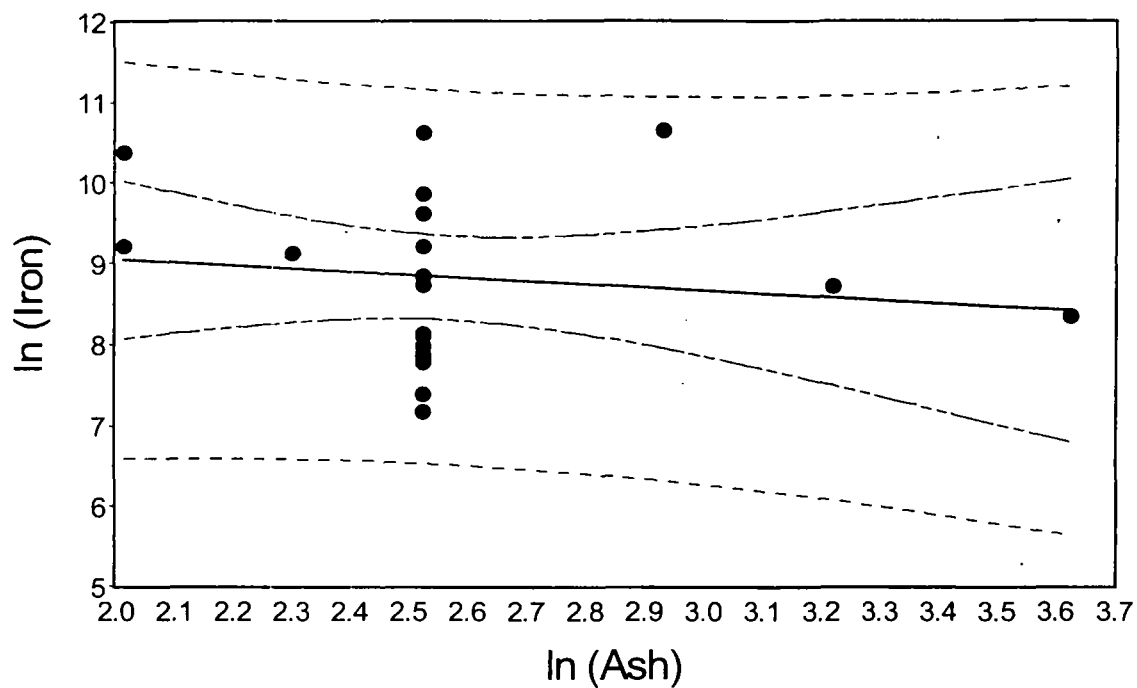
Regression equation =  $\ln(\text{copper ppm}) = 1.34 + 1.1 \times \ln(\text{ash \%})$ 

Regression Coefficient = 1.10

Intercept = 1.34

 $R^2 = 8\%$

## Ash vs Iron



## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean

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Regression equation =  $\ln(\text{iron ppm}) = 9.82 + -0.39 \times \ln(\text{ash \%})$ 

Regression Coefficient = -0.39

Intercept = 9.82

 $R^2 = 2\%$

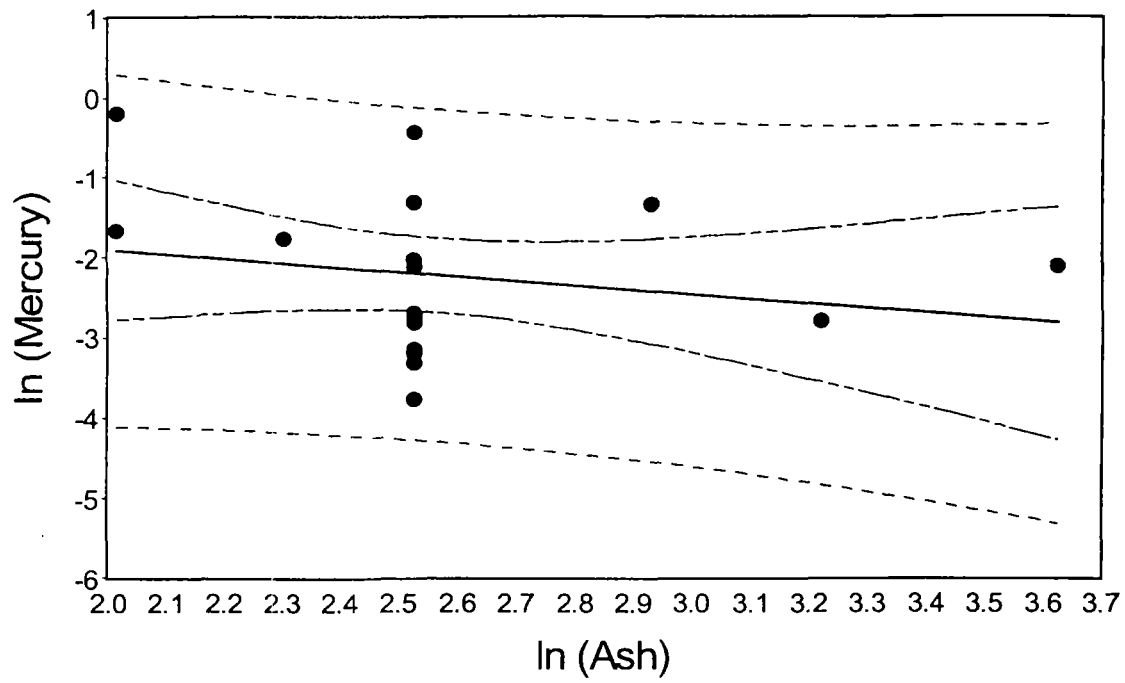


A scatter plot showing the relationship between  $\ln(\text{Lead})$  (Y-axis) and  $\ln(\text{Ash})$  (X-axis). The Y-axis ranges from 3 to 11, and the X-axis ranges from 2.0 to 3.7. The plot includes a solid regression line and dashed confidence interval lines. The data points are scattered around the regression line, with a notable outlier at approximately  $\ln(\text{Ash}) = 3.2$  and  $\ln(\text{Lead}) = 10.7$ .

Regression best fit line	-----
95% prediction limit for next concentration pair	- - - - -
95% confidence limits about the mean	----- - - - -

 $R^2 = 3\%$

## Ash vs Mercury



### Legend

Regression best fit line	—————
95% prediction limit for next concentration pair	- - - - -
95% confidence limits about the mean	- . . . .

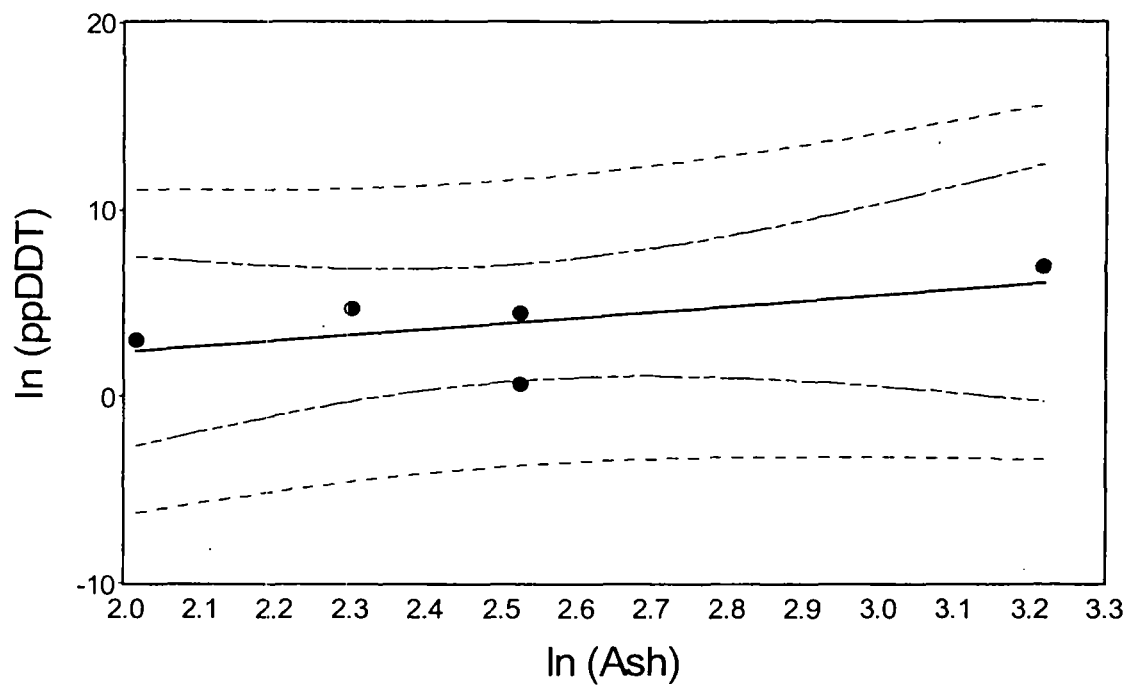
Regression equation =  $\ln(\text{mercury ppm}) = -0.77 + -0.57 \times \ln(\text{ash \%})$

Regression Coefficient = -0.57

Intercept = -0.77

$R^2 = 5\%$

## Ash vs ppDDT

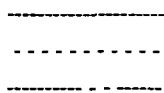


## Legend

Regression best fit line

95% prediction limit for next concentration pair

95% confidence limits about the mean



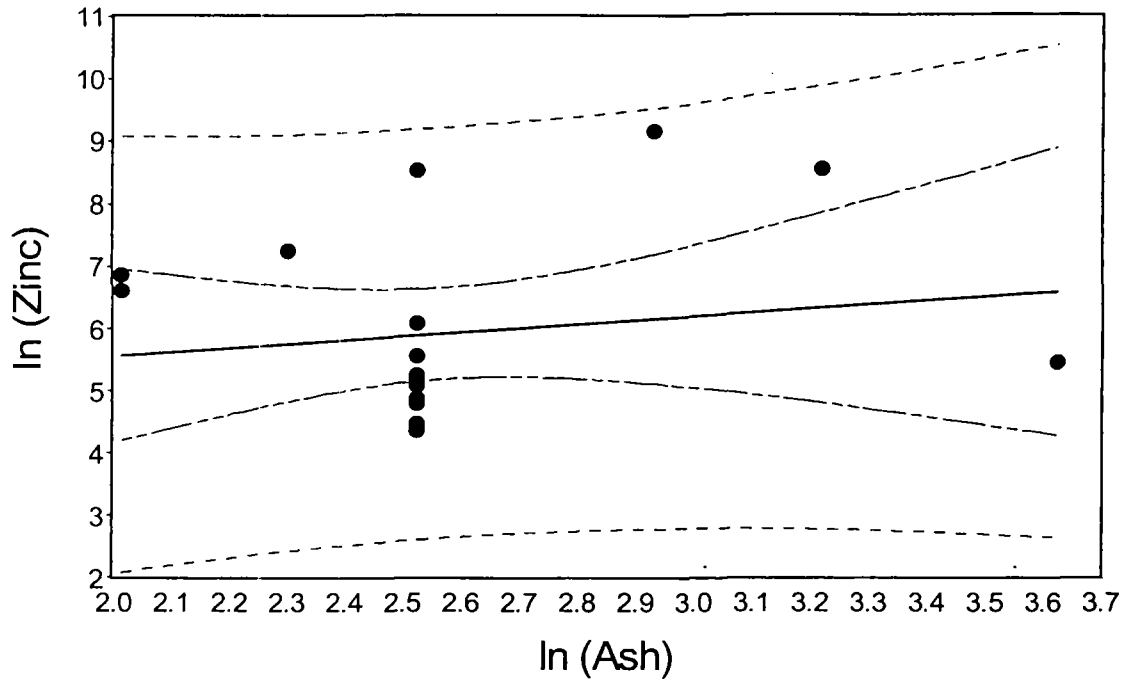
Regression equation =  $\ln(\text{pp-DDT ppm}) = -3.71 + 3.04 \times \ln(\text{ash \%})$

Regression Coefficient = 3.04

Intercept = -3.71

$R^2 = 33\%$

## Ash vs Zinc



## Legend

Regression best fit line

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95% prediction limit for next concentration pair

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95% confidence limits about the mean

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Regression equation =  $\ln(\text{zinc ppm}) = 4.32 + 0.62 \times \ln(\text{ash \%})$ 

Regression Coefficient = 0.62

Intercept = 4.32

 $R^2 = 2\%$